WORK

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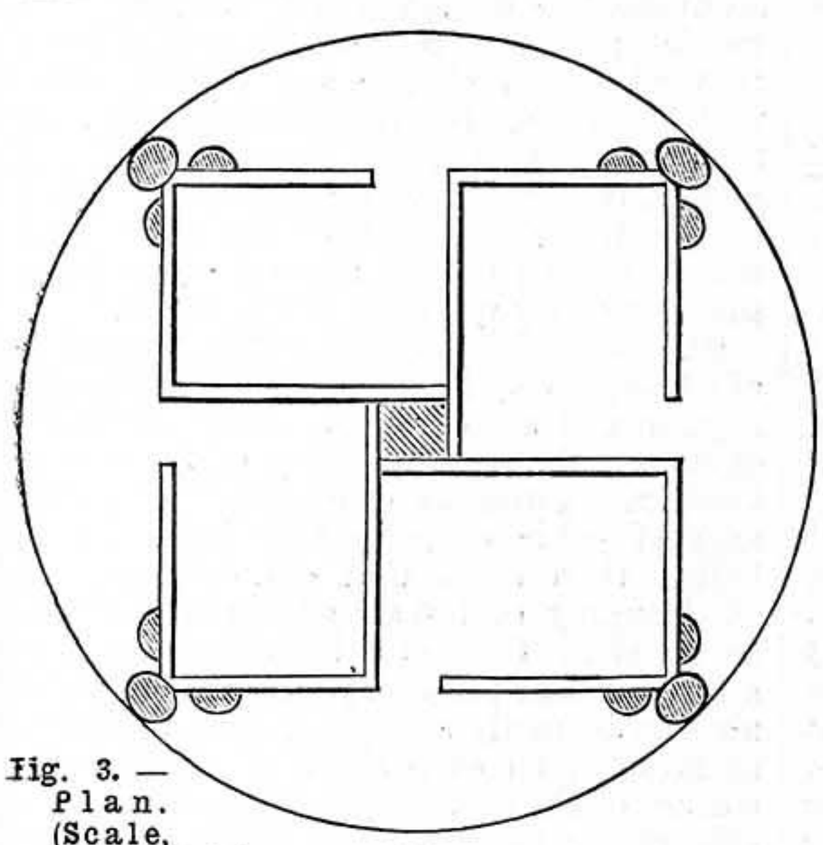


Fig. 3.—Plan. (Scale, 1½ in. to 1 ft.)

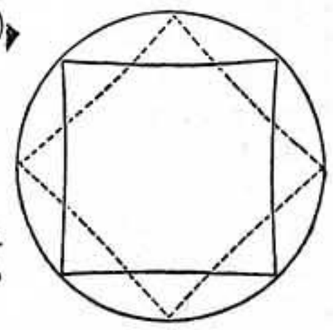


Fig. 2.—Section of Pole. (Scale, 2 in. to 1 ft.)

A RUSTIC DOVE-COT FOR THE GARDEN.

BY ARTHUR YORKE.

THE POLE DOVE-COT — THE WOODWORK — THE METAL ROOF.

The Pole Dove-Cot.—A pigeon-house of this kind has, it must be owned, its disadvantages: except for the hardier kinds of birds, it is apt to be too cold in winter, and may be too hot in summer. But there are situations in which it alone is available, and to those who keep pigeons, not for "the fancy" nor for profit, but for the pleasure of their company, none other is often so desirable, none other so well admits of being placed before a window, and thus to give the owner the full enjoyment of watching his pets; none other can be made so ornamental; nor, indeed, is any other so safe from the worst enemies of pigeons—cats and rats.

As it is in a garden that a dove-cot of this kind will most frequently be placed, it will be well to keep it in harmony with its surroundings, and unless the garden is very small or very formal, this, perhaps, will best be done by carrying it out to a great extent on rustic lines.

I say to "a great extent," and not altogether, for the actual boxes ought always to be neatly made of planed wood, and painted within and without. Pigeons are subject to parasitical vermin of more kinds than one, and all arrangements for housing them should therefore be made in such a manner as will allow of thorough cleansing.

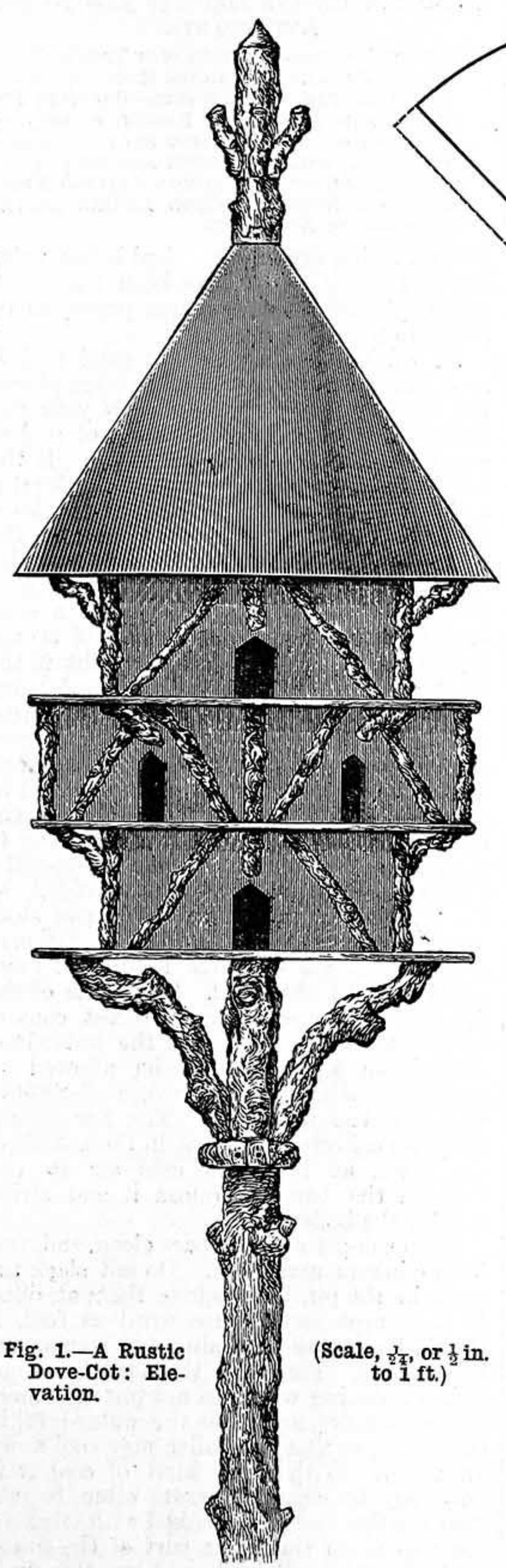


Fig. 1.—A Rustic Dove-Cot: Elevation. (Scale, ¼, or ½ in. to 1 ft.)

In the design before us this consideration has been kept in view. It contains twelve boxes—and good roomy ones—each being 18 in. by 12 in., and 13 in. high.

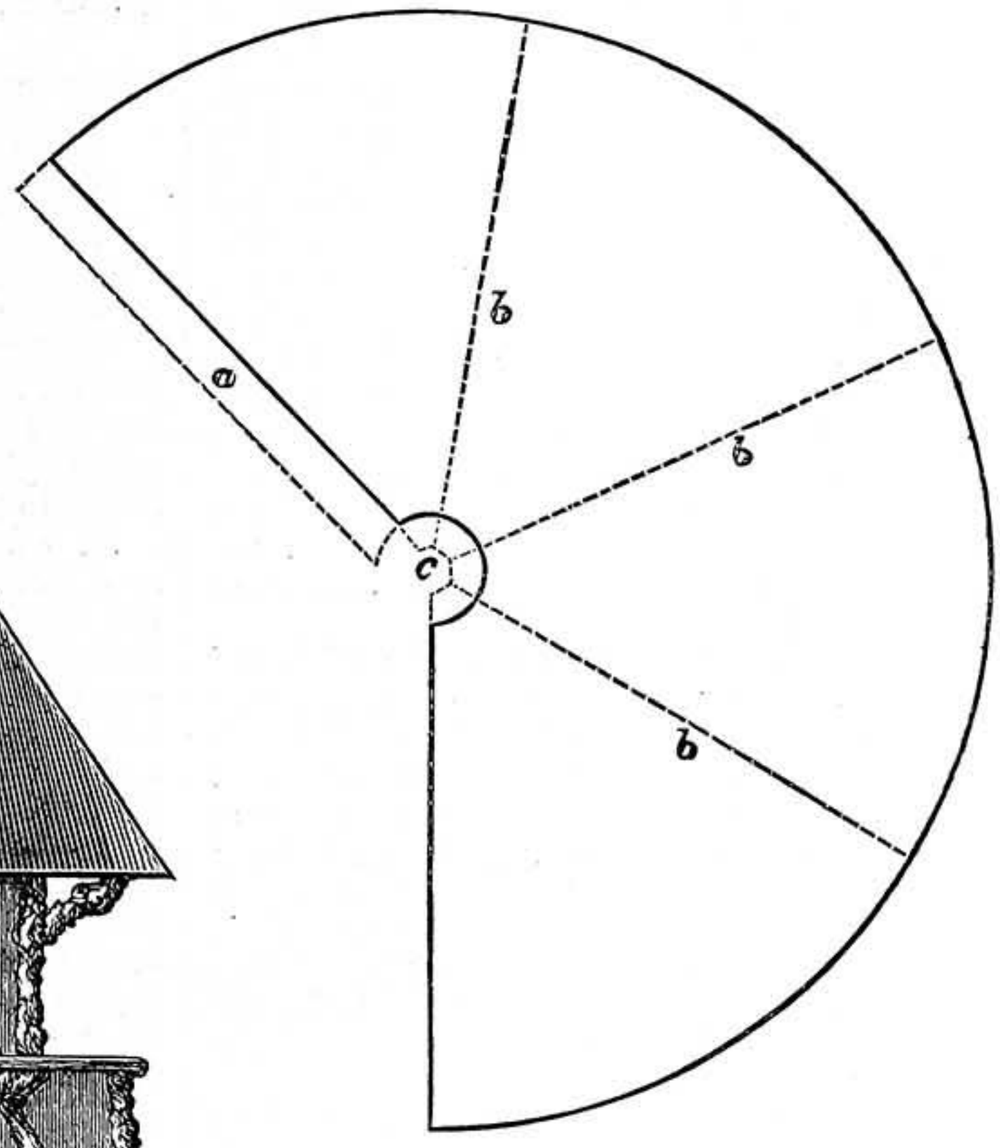
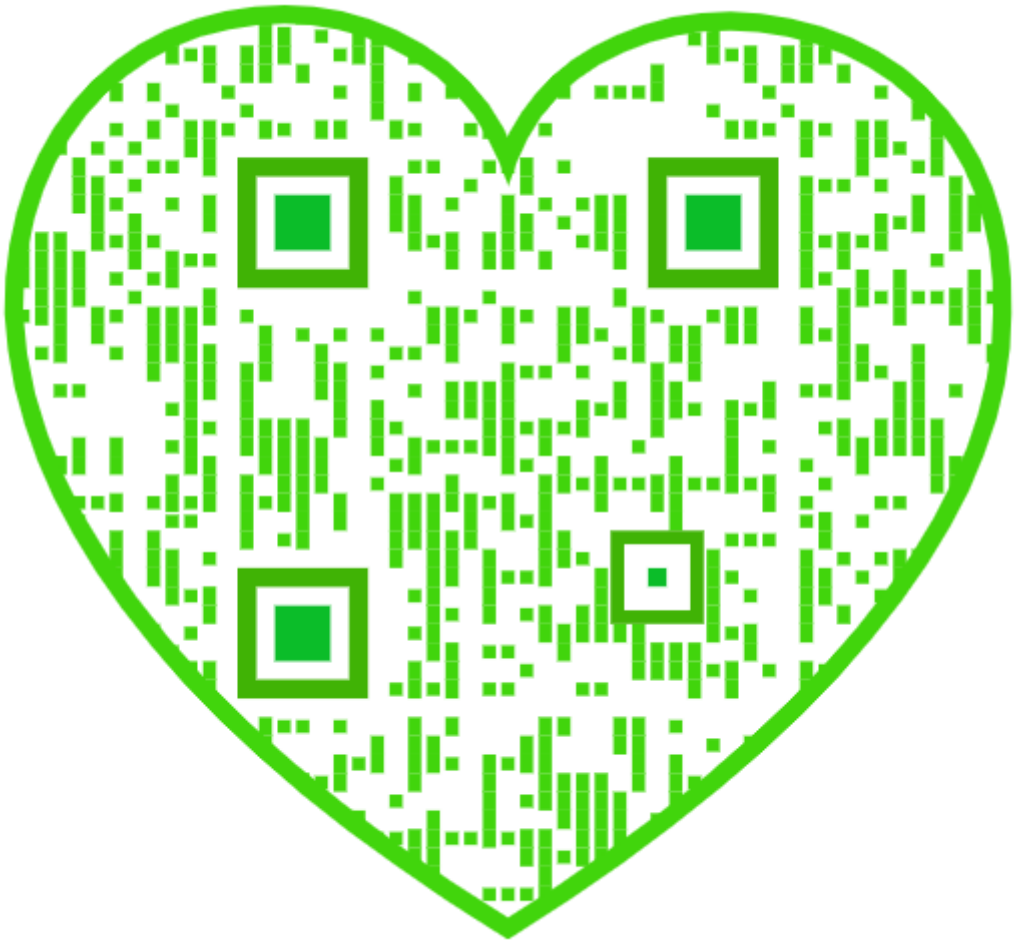


Fig. 4.—Setting out Metal Roof. (Scale, ½ in. to 1 ft.)

The illustrations are drawn to scale as named in the inscriptions to the diagrams, which see. By working out the design on a smaller scale, it might very well be adapted as a nesting-place for starlings or other wild birds. The starling gladly avails itself of any home provided for it, and no bird wages more inveterate war on grub pests than he. We in England treat him with too scanty courtesy; in some countries, as in Russia, the starling-box is a recognised institution in a garden.

Woodwork of the Dove-Cot.—The first and most important matter will be to provide a larch or other fir pole, of which the diameter will average, say, some 6 in. Its length may be varied to taste; some prefer the dove-cot higher, some lower, but few, we presume, will care to have its bottom less than 8 ft. or 10 ft. from the ground; to this must be added 2½ ft. or 3 ft. to be firmly planted in the earth, 6½ ft. for the height of boxes and roof, and 2 ft. for the finial above.

At the point marked off on the pole for the bottom of the cot, we make cuts with the saw on the four sides, and again 15 in. higher, and chip away the wood so as to leave our pole 4 in. square. This is the space for our lowest tier of boxes. To make a space for our middle tier, we treat the pole in the same manner for the next 14 in., only we make the corners of this second space to come opposite to the middles of the sides of the space below. Fig. 2 is a section of the pole illustrating this: the circle marks the original outline of the pole,



the black lines show the space for the lowest tier, and the dotted lines that for the middle one. The upper tier will occupy another 14 in., and this will be a repetition of that prepared for the lowest.

A reference to the plan of one of the tiers (Fig. 4) will show the use made of the squared spaces; one of the partitions which divide the boxes is nailed to each side, whilst the boards which form the outer walls are nailed to the ends of these partitions. For the comfort of the birds, 1 in. stuff should be used for all these pieces: it will be none too thick when planed. For the divisions between the tiers—floors and ceilings—which will be round discs of board 4 ft. in diameter, the best job will perhaps be made by screwing together at right angles two layers of ½ in. match-boarding. The disc for the top, it will be seen, is larger by 6 in. than the others, that it may give overhanging eaves.

In front of each cell we get a good space, 9 in. wide, for the birds to disport themselves, as they delight in doing; and each of these platforms is completely cut off from the rest, which, for the avoidance of quarrels between the cocks, is held to be an essential point. Our arrangement also places the entrance to each cell towards its end, not its middle, which is considered desirable, as giving privacy to the nest.

Having their bases on the disc of board which covers the top tier of boxes, and their perpendiculars against the pole, which is shaved level to receive them, we nail four triangular pieces of 1 in. board to serve as rafters for the metal roof. We give to these pieces a perpendicular height of 3 ft. It will be a good plan to fill the places between them and the metal covering with sawdust, which, being a non-conductor of heat, will tend to equalise the temperature of the cells.

The few pieces of rough wood used as rustic decoration are so plainly figured as to need no verbal description, but before they are fixed in place the planed work should receive a couple of coats of paint. In the interests of cleanliness it is recommended that the insides of the cells should be painted white; the outsides will look best coloured of such a brown as will go well with the bark of the rustic-work.

The Metal Roof.—It is proposed that this should be of zinc or sheet-iron. For my own part, I should prefer black (ungalvanised) iron, as on this paint will stand best. Setting out a conical roof is not a difficult matter. We strike a circle of which the radius equals the length of our rafters, or rather, what a rafter would be if they formed a complete cone instead of terminating at the side of the pole. Of the disc thus marked out we measure so much on the circumference as equals the length of our eaves, and from the ends of the portion measured draw lines to the centre. This gives us the piece of metal we require, except that we shall need a trifle more to lap over and nail down. In Fig. 4. drawn to a ½ in. scale, we have such a piece of metal as will be required for the roof before us. The dotted lines at *a* show the over-lap, which is nailed through the corresponding edges of the metal to one of the rafters; and at *b*, *b*, *b* are lines which show where the nails into the other three rafters will pass. At *c* is seen the size of the opening to admit the passage of the pole. Strong copper tacks are best for fixing on the metal cover, and if the latter is of zinc a better job will be made by soldering the joint. There is no reason why the covering should not be cut from two or four pieces of metal, if it is found more convenient to do so.

A good colour for the roof—one which will go well with the body of the dove-cot and rustic-work—will be a dark sage green.

ENGINE AND BOILER MANAGEMENT.

BY M. POWIS BALE, M.INST.M.E., A.M.INST.C.E.,

Author of "A Handbook for Steam Users," "Wood-working Machinery," "Stone-working Machinery," "Pumps and Pumping," etc.

RULES FOR ENGINE DRIVERS AND BOILER ATTENDANTS.

FIRING THE BOILER—PREVENTION OF SMOKE—FIRE-BARS—WORKING PORTABLE ENGINES, ETC.—WORKING TRACTION ENGINES—WORKING ENGINES AND BOILERS IN FROSTY WEATHER—BLOWING OFF OR EMPTYING STEAM BOILER—CLEANING BOILER—ENGINE AND BOILER OUT OF USE—STOPPING ENGINE—BANKING FIRES FOR THE NIGHT—A GOOD ENGINE DRIVER AND BOILER ATTENDANT.

IN continuing my subject I had better point out that Rules 1—18 have been laid down and explained in a previous paper, to be found in page 229, *et seq.*

19. *Firing the Boiler.*—Use good fuel if possible. Do not put coal on in large pieces, but break it to about the size of your fist. Do not put on a large quantity of fuel at one time, but fire little and often. If the fire burns unequally or into holes, level it and fill up the vacant spaces. If anything, the fire should be rather thinner in the centre than at the sides of the fire-box. Do not let the fire get low before a fresh supply of fuel is added; keep the furnace door closed unless there is a surplus of steam. Be careful in regulating the draught in the fire-box or furnace to suit the fuel being consumed. We recommend, wherever possible, the use of an automatic steam damper. A good supply of air promotes combustion, and tends to prevent smoke. In Cornish or Lancashire boilers, begin to charge the furnace at the bridge, and keep firing to within a few inches of the dead-plate. Excessive draught should be avoided, as the heat is carried rapidly away, and sufficient time is not given for the combustion of the various gases. Coke requires a more rapid draught than coal. The flame of the fire should never come in direct contact with the boiler-plate above the water-line. The flame should never be allowed to impinge constantly on one spot, either above or below the water-line. The fire should never be collected in a heap in the middle of the grate, as it allows cold air to rise through the bars all round it and strike against the boiler-plates.

Keep ash-pit and fire-bars clean, and free from clinkers and ashes. Do not slack the ashes in the pit, but remove them at once. If it is necessary to use wood as fuel, it should be dry, and be reduced to pieces, say, 12 in. long. For, say, the last half-hour before finishing work, do not put any more fuel on the fire, and raise the water-level in the boiler, so that the boiler may cool down gradually. With some kind of coal it is necessary to clean the grate often, to prevent the fire becoming choked with clinkers, etc.; to clean the front part of the grate, push the fire well back, and use the slicer and clinker hook freely; to clean the back of the grate, bring the fire forward, and pull the clinkers over it. When this is finished, spread the fire evenly again, and put on a moderate supply of coal. The fire should not be allowed to burn too low before cleaning, or the steam pressure may drop considerably, or the fire go out. Before cleaning, see that there is a good supply of water in the boiler, and partly close the dampers whilst cleaning. Remember that scale in the boiler and choked tubes often render it necessary to force the fire to make up the loss accruing therefrom. Fire as rapidly as may be, and do not keep the furnace door open longer than is necessary. Whenever possible, the damper should be kept closed when the furnace door is open, and *vice versâ*. A bright, incandescent fire will reflect a bright light into the ash-pit. If the ash-pit is dark, there is probably an accumulation of ashes or clinkers that require moving. A good fireman will see that no useful cinders are thrown away with the ashes. If a forced draught is used, thicker fires than those already mentioned may be employed, but care should be taken that a forced draught is not used when the grate is partially uncovered, or leaky tubes or seams will soon be the result.

20. *Prevention of Smoke.*—The prevention of smoke is very largely a matter of careful, regular, and even firing, and the admission of exactly the right quantity of air into the fire-box. Furnaces constructed of ample area of cubic capacity will burn smoke better than those that are confined. A good supply of hot air admitted from the bridge of the furnace aids combustion. Use a furnace door through which the supply of air may be easily regulated, so as to spread, as it were, an even sheet of air over the surface of the fire. Alternate firing on each side of the furnace has a tendency to prevent smoke, but with most coals the author can recommend the following plan as a decidedly good and effective one for aiding combustion and preventing smoke. Supposing the fire to be in an incandescent state, and it is necessary to put on more fuel; instead of throwing the coal on in the usual way, push back the fire from the front part of the fire-grate on to that behind, nearer the bridge, leaving the front of the grate bare. Now charge the front part of the fire-box with fresh coal; this will gradually coke, and the various gases, etc., which form smoke will be liberated at a slow rate, and give time for the air passing up through the fire-bars to become heated and mingle with them, thus promoting tolerably perfect combustion. With this plan, with ordinary steam coal and tolerably open fire-bars, a sufficiency of air will pass up through the fire-bars in the front of the grate to consume the gases, and large volumes of smoke need never be made, as is the case when great quantities of fuel are thrown on to a hot fire. The reason of this is that in this latter case, owing to the incandescent fire acting quickly on the coals, the combustible gases or hydro-carbon are so rapidly released that there is not a sufficiency of air admitted to the fire-box and heated fast enough for it to combine with and consume the liberated gases; hence the production of free carbon or smoke. This coking system of firing should be performed at regular intervals, and only moderate supplies of fuel be put on at one time.*

In cases of urgency smoke may be "whitewashed" by turning the exhaust or a jet of steam into the base of the chimney-stack. Bear in mind, a blue flame shows imperfect, and a white one tolerably perfect combustion.

* "A Handbook for Steam Users." M. Powis Bale (Longmans & Co.).

21. *Fire-Bars.*—As the bars are burnt out, renew them; do not wait till the whole set is worn out. Allow a good current of air to enter through the ash-pit and fire-bars, or the latter may become over-heated—especially with some kinds of fuel—and burnt out. If the fire burns sluggish, it may be from insufficiency of draught, or the fire-bars may not be provided with sufficient air spaces, and these, getting choked, require constant attention to prevent the bars warping or burning. Keep the ash-pit and fire-bars clean and free from clinkers and ashes. Do not allow an accumulation of hot ashes in the ash-pan or pit, as they have a tendency to twist the fire-bars. In some cases, with coal given to form much clinkers, etc., rocking fire-bars may be used with advantage. Do not take more time than is necessary in cleaning bars, leave the damper open, and when the coal is pushed back, do not let a fierce fire impinge against one place in the fire-box for any length of time. Hard steam coal requires less air space between the bars than a flaming bituminous coal. Never throw water into a warm fire-box to loosen ashes or clinkers by contraction.

22. *Working Portable Engines, etc.*—In the case of portable engines, place the driving wheel exactly in a line with the pulley of the machine to be driven. Fix the smoke-box slightly higher than the fire-box end. Wedge up the wheels, and see that the engine does not rock in working. Always keep about 2 in. of water in the gauge-glass, and blow off occasionally through the glass to see that the ways are clear. Clean the boiler periodically right through, and if the water is bad, remove the hand-hole in the fire-box, and carefully remove all sediment over the fire. An accumulation of sediment is the chief reason for burnt boiler-plates. On finishing work, a great deal of scum and dirt may be got rid of by blowing off at a low pressure, if possible, when the engine is being removed to a fresh job.

23. *Working Traction Engines.*—As regards the working of traction engines, the rules given above will apply equally well to those as to most other types of engines and boilers; in addition, however, the driver of a traction engine should bear the following points in mind:—(1) Keep a good supply of water in the tank. (2) Disconnect the traction gear, and start the engine under a moderate head of steam—say, 25 lbs. pressure—to see that the pump and all the working parts are in order. (3) Carefully oil all bearings, and grease the teeth of the various wheels. (4) For travelling, get steam up to about 75 lbs. pressure. (5) When going down a hill, the gauge-glass should show 1 in. of water; when going up, about 4 in. (6) In going down hill, lock the hind wheels of any vehicle being drawn; use the reversing lever, both for shutting off steam and for checking the momentum of the engine, by admitting steam to the reverse side of the pistons.

24. *Working Engines and Boilers in Frosty Weather.*—When working in frosty weather, the following additional precautions are advisable:—(1) Close the tap between the boiler and the water-gauge glass when the boiler is stopped for the night, and let the water out of the glass. (2) Leave the cylinder-cocks open to drain off the condensed water, also the jacket-cocks if the cylinder is jacketed. (3) Examine the pump and valves and supply pipes carefully before starting work; if frozen, pour hot water on them till the ice is thoroughly melted. (4) In very frosty weather have the fly-wheel of the engine barred or turned round by hand a few times, in case of ice being in the cylinder. (5) Thoroughly warm the cylinder before starting; carefully try the different cocks, and pour hot water on them if stiff. (6) See to the cylinder and other lubrication. Kerosene mixed with oil will prevent it freezing. (7) Leave all drain-cocks in pipes, etc., open; the water in boiler may be prevented freezing by banking the fire.

25. *Blowing Off or Emptying Steam Boiler.*—If the boiler is emptied under pressure—a practice I do not usually recommend—the pressure should not exceed, say, 10 lbs. per square inch. It is better to let the damper be open and blow off through the safety-valve, at the same time adding fresh cold water to mix with that in boiler if early cooling is necessary. On no account throw cold water on hot plates. The cooling should be gradual and general; it is better not to let the water out of the boiler till the boiler-plates and boiler-seatings are cool. Never admit cold water when the boiler is empty and warm. One disadvantage of blowing off under pressure is that the boiler-plates and brick-work, being left hot, have a tendency to harden any scale or incrustation that may be adhering to them. Before removing man-hole or other covers, lift the safety-valve, and make sure that there is no steam in the boiler; neglect of this precaution has caused accidents.

26. *Cleaning the Boiler.*—To clean the boiler, remove all the covers of the man-holes; scrape, or, if there is much hard incrustation, chip the interior surface, thoroughly loosening and removing all sediment and dirt. Pass a quantity of clean water through the man-hole. Examine and clean all feed-water and other pipes periodically; remove and scrape fusible plug, and renew if necessary. Keep all flues or tubes thoroughly clean and free from soot, etc. Examine all cocks and fittings, and see that they are in order and free from leakage. Examine the flues, and see that the boiler-seatings are dry, and that there is no leakage either from the seams or from the roof. Tubular boiler tubes should be swept once a day, or twice if the fuel be bad. This can be readily done with a jet of steam.

27. *Engine and Boiler out of Use.*—When a boiler is out of use for a time, it should be entirely emptied of water, carefully dried, and painted with an oxide paint inside and out. Several boxes of quicklime for absorbing moisture should be put inside the boiler, and if on inspection it is found much slaked, it should be renewed. Coat the bright parts of the engine with a mixture of white lead and boiled tallow: say, 2 lbs. of the former and 6 lbs. of the latter; or, if preferred, a mixture of boiled oil and turps may be used.

If an engine has been standing some time, it should be thoroughly overhauled and cleaned over with paraffin to remove dirt, and well lubricated. Before starting, the engine should be well blown through with steam to warm the cylinder and try the joints, which may require renewing.

28. *Stopping Engine.*—In stopping the engine, turn off the steam gradually, and not suddenly, as this latter practice has been known to start joints or split pipes from the shock arising from the sudden stoppage of the flow of steam. Unless a barring engine is used, care should be taken that large engines are allowed to stop on the dead-centre, or they will give considerable trouble in being levered round by hand. Large establishments should be so arranged that instant communication can—in case of accident—be made with the engine driver. An electrical apparatus is now in use by which the engine can be instantly stopped from any desired point.

29. *Banking Fires for the Night.*—Although there is some little danger attached to the practice of banking fires, in a series of boilers it saves a great amount of trouble, and is generally resorted to. The following precautions should, however, be observed: (1) Put the safety-valves to blow off at a low pressure—say, 10 lbs. (2) Leave the furnace doors open. (3) Close the dampers and ash-pan lids or ash-pit doors. (4) See that each boiler has a full supply of water and the float is in order.

A good plan in banking is to partly clear the front of the fire-bars and push the fire into a gradual bank at the back, making it as solid and free from air spaces as may be; then cover with wet ashes and coal-dust mixed, to a depth of, say, 6 in. Arrange the admission of air so that there is just sufficient to keep the fire alight, and nothing more. It may be added that judicious banking of a fire is less injurious to a boiler than the constant lighting up and drawing the fire out, as the extremes of expansion and contraction are done away with. It is somewhat difficult and risky to attempt to bank fires in tubular boilers.

30. *A Good Engine Driver and Boiler Attendant.*—The greatest factor in the making of a clever engine driver and boiler attendant is regularity. A good man will keep up an even and regular supply of fire, water, and steam the whole day through, whilst a careless or inefficient man will have steam blowing off one hour and a pressure barely sufficient for the work the next. An incompetent attendant is dear at any price. To test accurately the performance of the engine under his charge, the skilled engine driver should be capable of working the indicator and taking diagrams; this work, however, I am afraid at present is relegated to those higher in authority, but there is no reason why a fairly-educated man should not do it, as several plain and practical treatises are published on the subject.

WIRE-WORK IN ALL ITS BRANCHES.

BY JAMES SCOTT.

LACING—A SHUTTLE—SPLICING—CUTTING UP.

"LACING" is the technical term used by wire-workers for the operation of securing wires to each other continuously at their various junctions. Mr. Frank Hinds, in WORK, Vol. II., No. 54, page 22, shows in a very distinct manner a method of thus binding the different wires, and I will ask my readers to refer to his article upon Bird-cages in the number alluded to above, as affording additional explanation to the few remarks I am about to make.

In beginning to lace a certain part of any work, the end of the binding or lacing wire should be tied in place, if there is no possibility of otherwise fastening it to obtain the necessary security. The work is generally proceeded with from left to right if the work is horizontal, and from bottom to top if vertical.

In Fig. 53 it is supposed that the lacing wire is bent as shown in Fig. 46 (page 244); and if the reader will imagine that he can see through what is intended to represent the straight wires in Fig. 51, the parts indicated A, A, in Fig. 53 would be behind those

wires; while those marked B, B would be in front.

When lacing, the travelling end of the lacing wire is put through the second mesh, on the left-hand side, above the cross-wire, brought diagonally behind the first junction, under the bottom of the cross-wire, and out of the first mesh underneath the cross-wire; proceeding in this manner all along, by next putting the wire through the third top mesh, and out through the second lower mesh, then through the fourth and out through the third, and so on. A double stitch or lace is that shown in Figs. 54 and 55. Where there are several cross-wires to be bound, it is the usual practice to lace the first from left to right; the second, from right to left; the third, from left to right, as the first; and continue in this manner until the completion, the tendency of this being to keep the work together in a better manner.

Mr. Hinds, in his article on Bird-cages, shows a shuttle, but does not go to any length in speaking about it. Perhaps a few remarks here will prove serviceable. These articles are generally made of bone or ivory, but I see no reason why a workman should not make one in wood for his use. A and B, Fig. 57, are two pieces shaped as in plan, Fig. 56, and, with the ends (when the various pieces are finally fixed), nearly touching each other. In the middle, between the two, will be a turned piece (C, Fig. 56) screwed in place from outside the last-mentioned pieces. The wire, as perhaps can be comprehended, is wound around the cylindrical portion of the shuttle, as is cotton around a reel. By its means the hand can firmly pull the lacing wire into position, and no inconvenience is created by the wire dangling about, as would be the case without the aid of it or something similar. As the lacing progresses, the wire can be gradually unwound from the shuttle. Of course, it must be comparatively thin in construction to permit it to enter fine meshes.

I feel rather dubious as to whether I shall satisfactorily explain the operation of splicing. The term is associated with the unison of two opposite ends of a piece of work, thereby forming a compact cylindrical

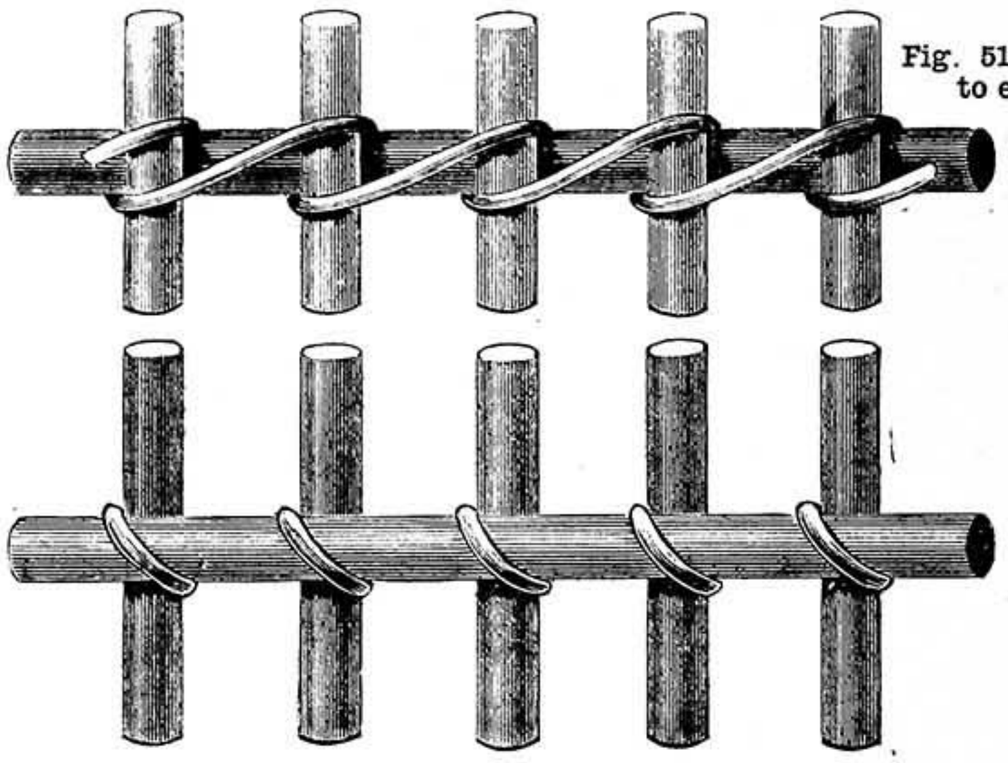


Fig. 51.—Wires laced to each other.

Fig. 52.—Back View of Fig. 51.

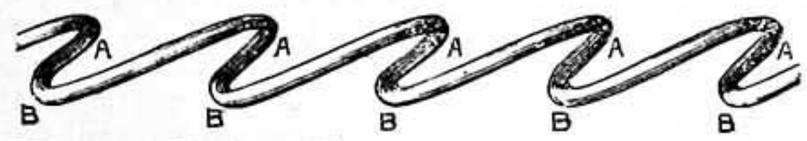


Fig. 53.—Lacing Wire in Fig. 51, with thick Wires removed.

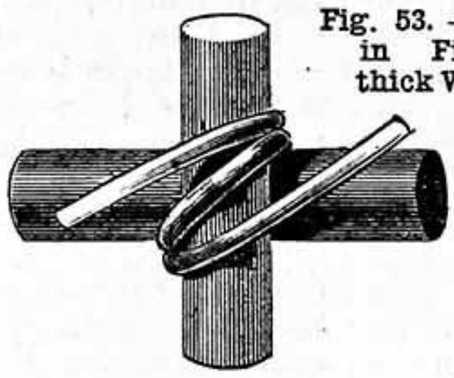


Fig. 55.—Double Stitch in Lacing (Back View).

Fig. 61.

Fig. 62.

Fig. 54.—Double Stitch in Lacing (Front View).

Fig. 63.

Figs. 61, 62, 63.—Various Forms to which Wires shown in Fig. 60 can be easily bent.

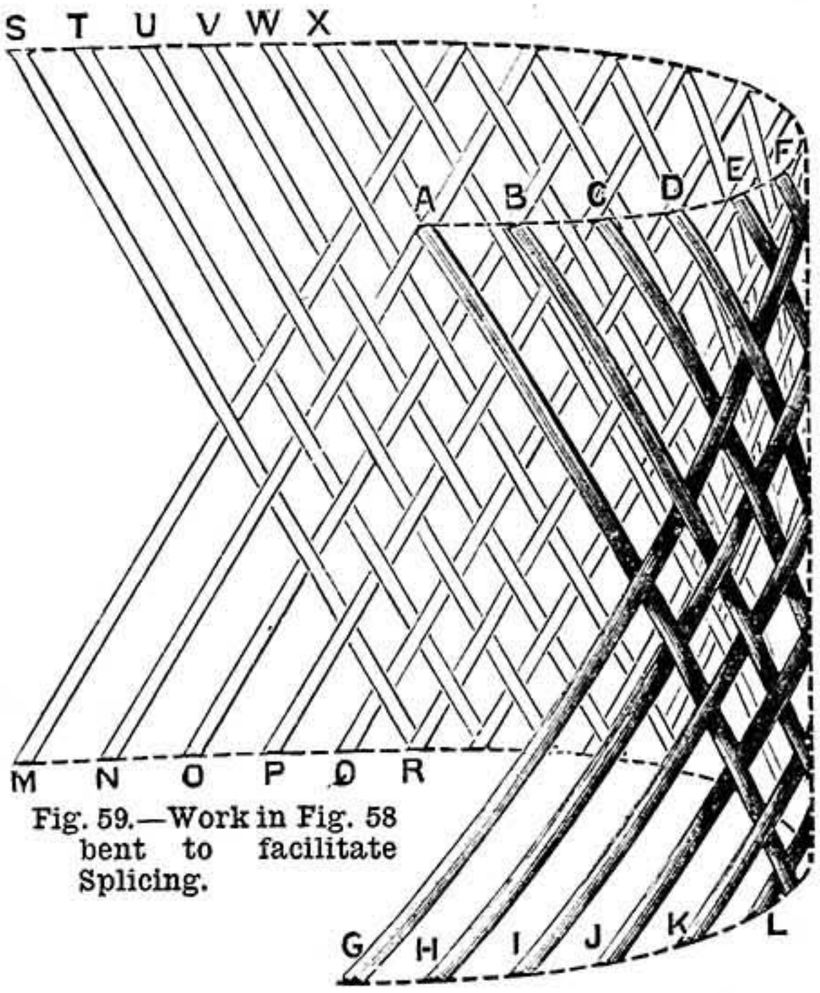


Fig. 59.—Work in Fig. 58 bent to facilitate Splicing.

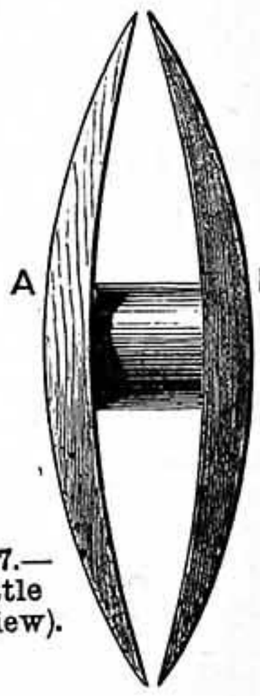


Fig. 57.—Shuttle (Side View).

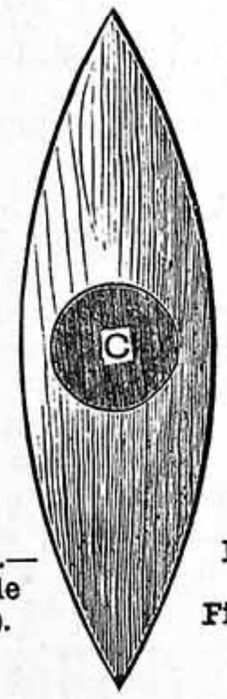


Fig. 56.—Shuttle (Plan).

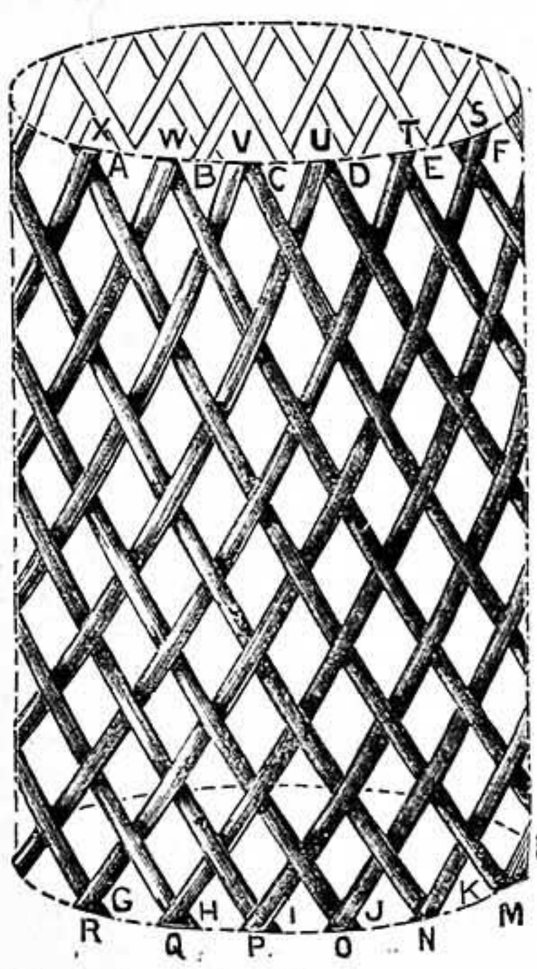
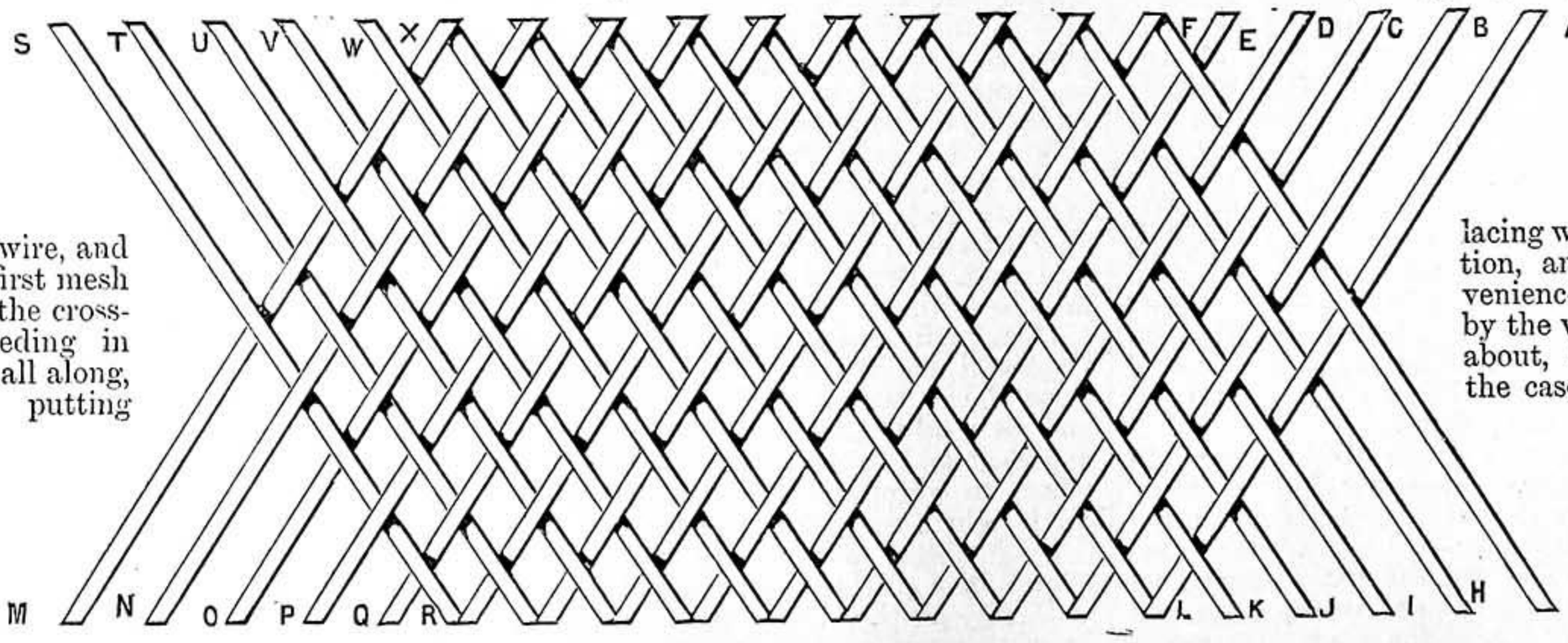


Fig. 60.—Work in Fig. 58 completely Spliced.

Fig. 58.—Piece of Work ready to be Spliced.



object. I must say that the performance, or the attempt at such, is very provocative of tantalisation, as I have personally experienced; for, although I am not a wire-worker, I have a desire to understand as thoroughly as possible what I am striving to convey to my readers, and, with this object, experiment, as well as circumstances will allow, after I have received practical tuition from my practical friend.

In Fig. 58 is shown a piece of work supposed to be quite flat. To splice it, it would be bent as in Fig. 59, in order to bring both ends of it in contact with each other. In these diagrams I have lettered the wires that will be spliced. The two ends are brought closely together, when, if found to be too "springy," they could be held in position by having a wire twisted around them bodily. It would then be seen that the free portions of the wires A, B, C, D, E, F would be parallel with the free portions of G, H, I, J, K, L; and those of M, N, O, P, Q, R parallel with S, T, U, V, W, X—thus presenting a continuous and endless series of diamonds completely around the piece of work.

At this point the free portion of the wire A would be slipped under S, over T, under U, over V, and so on. Then the free portion of S, which will then occupy less length, should be slipped under B, over C, and so on. The free end, B, would be the next to be spliced, then T, by following which order the wires can be spliced to the same meshes as those first obtained by putting the wires together as in Fig. 53. The wires M, N, O, P, Q, R would be spliced in a similar but reverse manner to those of which I have just been speaking. Wire M would pass over G, under H, etc., as the other wires did in connection with their companions. When spliced, every mesh should be of the same size, and the wires should cross, each one over and under its fellows, in such a manner that it would be impossible for anyone to detect their junctions.

A piece of work so spliced would be capable of being bent to various forms without losing its strength. It will be found an impossible matter for anyone to pull apart a piece of spliced work without undoing the different wires; mere pulling effects nothing—*i.e.*, except to widen the work. Wire baskets, of which the bottoms are smaller than the tops; gas globes (one particular pattern), of which the middles are considerably wider in diameter than the tops and bottoms; and several other articles, are formed from spliced work which is at first of the same diameter at the top as at the bottom.

Of this I shall speak more fully when I arrive at the descriptions of the various articles alluded to; but to give an idea of the manner in which a piece of spliced work can be bent, I will say that the forms shown in Figs. 61, 62, and 63 are various shapes to which the work shown in Fig. 60 (drawn to a much smaller scale, however, in the other diagrams) may be bent or pulled. Each piece would contain the same number of wires of precisely the same length and gauge as the others. No weakening takes place by thus forming the work to these shapes. Perhaps I ought to mention that when the wire is spliced as in Fig. 60 it has a tendency to bend inwards towards the middle, instead of being quite perpendicular all round, as it would be supposed from my diagrams.

For the purpose of cutting wire, the shears are utilised. If a number of wires of one length are required, such as for putting together, etc., they are not cut up one by one, but the wire is drawn from the coil for a distance as far as the shop will permit, and each of these lengths cut off from the remainder, until several are ready, when they, in a bundle as it were, are again divided together into the smaller necessary lengths.

On such occasions as these, it will be found best—indeed, I might say absolutely necessary—to fix the shears in a vice. One only of the handles of the former will be secured in this manner, leaving the remaining handle for the operator to use.

Of course, for cutting short work of only a few wires each time, the use of the hand shears will be quite sufficient.

A NOVEL COMBINATION PENHOLDER.

BY W. R. R.

INTRODUCTION—PENHOLDER—CORK—INKING PAD—RULING WHEEL AND ATTACHMENT—DESIGNS FOR WHEEL—INK—DESIGNS.

Introduction.—Multum in parvo (much in little) is the demand of the utilitarians of the present age. A person requires a pocket-knife, and at the same time remembers he may some day also require a corkscrew, a glass-cutter, a file, a pair of tweezers, a saw, or even a magnet, which latter article is very useful for removing iron specks from the eye. So, for a little extra outlay, he purchases this miniature tool-chest in the form of a "Combination Pocket-knife."

Now, I propose to benefit the wielders of that instrument which "is mightier than the sword" by describing how to make a "Combination Penholder," hoping that it will prove acceptable and be a real boon, from the humblest student, struggling tediously to insert a neat mountain range in his examination map test, to the finished draughtsman engaged in "lining in" his mechanical drawings.

Penholder.—Having procured an ordinary wooden penholder and a piece (or pieces) of cork, proceed to shape the cork with a razor or keen-edged knife, as shown at *a*, Fig. 1. If a cork-borer (which is only a bit of tubing sharpened) is not come-at-able, the cork may be split in halves and hollowed out to fit the holder, and then fixed with glue. Some persons may object to this apparently clumsy innovation to the holder, but I can assure anyone who is troubled with writer's cramp that they have here a considerable relief, if not a perfect cure, for that disease of the nerves.

Inking Pad.—The next step is the construction of the inking pad for the ruling wheel, *b*, Fig. 1. This consists of a small piece of wood shaped as in Fig. 4, on which is glued a small cotton-wool cushion covered with silk. The pad is held in position by a ring of stout sheet brass and small spiral spring of wire, *c*, Fig. 1. The width of the pad ought not to exceed the diameter of the holder, or else some difficulty will be experienced in holding the pen in position against the edge of the ruler.

We now come to the most important part of the attachment—viz., the ruling wheel, *d*, Fig. 1.

Ruling Wheel and Attachment.—The shoulder for holding the wheel and attaching it to the penholder may be cut out of sheet brass or other suitable metal. Draw the pattern on the sheet brass with a needle-point or scriber same as Fig. 2. Cut out and shape on rod of iron same diameter as penholder. The shoulder will now resemble a pencil-point protector.

The ruling wheel itself now claims our attention. It may be made of wood or metal, and the desired pattern engraved upon it, but the most preferable wheel is one with a wooden body and indiarubber tyre, on which the design is cast. The indiarubber type-founding firms would doubtless cast a few strips of designs to order, from which suitable lengths could be cut and glued on to the wheel. Of course, for different designs a different wheel must be employed in the shoulder.

Ink.—Coloured ink suitable for using on the pad is made from aniline dye dissolved in spirits of wine, and can be made to dry with a glossy surface by the addition of a few drops of liquid gum arabic. Be careful,

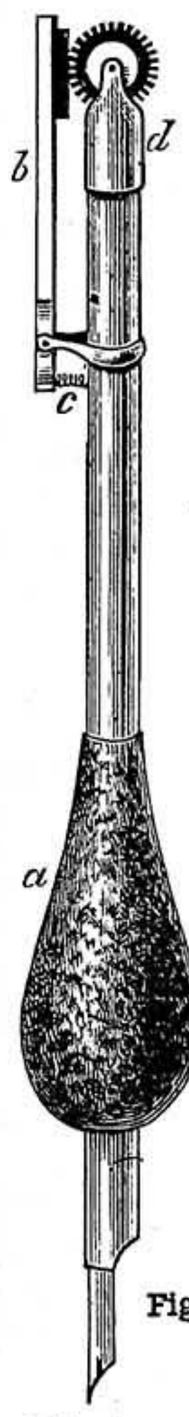


Fig. 1.

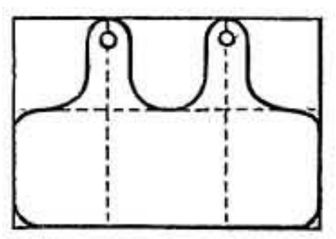


Fig. 2.

Fig. 3.

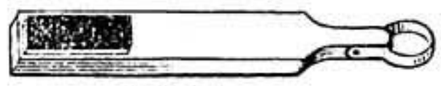


Fig. 4.

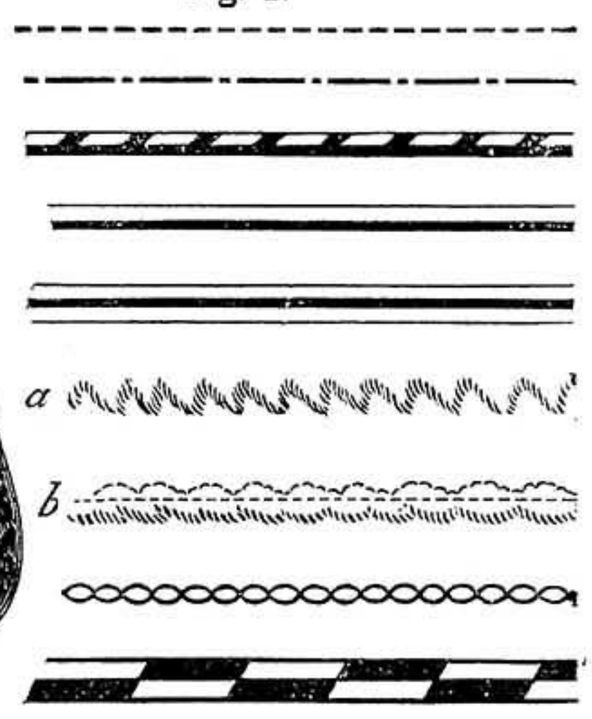


Fig. 5.

Fig. 1.—Pen complete. Fig. 2.—Shoulder for Wheel marked off on Brass. Fig. 3.—Shoulder and Wheel complete. Fig. 4.—Inking Pad. Fig. 5.—Designs for Ruling Wheel—*a*, *b*, Mountain Ranges for Map Drawing.

however, not to wet the pad too much; a moist surface is all that is required.

Designs.—The designs shown in Fig. 5 are merely suggestive of the kind of work which can be turned off by aid of the *novel penholder*.

FRENCH POLISHING: SPIRITING OFF.

BY DAVID DENNING.

NECESSITY FOR SPIRITING OFF—CLOSE CONNECTION OF BODYING IN AND SPIRITING OFF—SPIRITING OFF DEFINED—PRELIMINARY PROCESS—SPIRITING OFF PROPER—APPEARANCE OF GLOSS—FINAL TOUCHES—HINTS TO INQUIRERS IN "SHOP."

THE final operation in French polishing is known as "spiriting," or "spiriting off." By it the gloss, or shine, is put on the body previously applied, as directed in a former article. Rubber marks and smears of all kinds are removed, and the beautifully finished surface, which is known as a French polished one, should be the result. If bodying is important so far as durability is concerned, spiriting is more so with regard to finish, or fine bright gloss. However

well the rest of the work may be done, if the worker fails in spiriting, his previous efforts will, to a great extent, have been in vain. So far as mere polishing goes, and not alluding to staining, darkening, and other processes, with which a good polisher should be acquainted, the spiriting is perhaps the most severe test of skill. If a man can manage this part of his work really well, he may fairly be considered a competent polisher. To tell how to do spiriting off is a comparatively easy matter, but no amount of explanation will make anyone an adept at spiriting, for there is a knack in it which can only be acquired by painstaking practice. From this it may be gathered that the novice must not be disappointed if his early efforts meet with only partial success; or, to put it more strongly, it would be unreasonable for him to expect that, however closely he may follow ample and reliable directions, he will be able, without practice, to polish thoroughly. Perfection in polishing cannot be attained at once, so, while doing his best, it is no use for the beginner to fancy that he ought to be able right off to do what it takes years for professional polishers to learn.

I hardly know whether the first operation to be described in the present article should not rather have been included in the article on bodying in, for it partakes at least as much of that as of spiriting. It is not, however, of much consequence where it is placed, because at the beginning it is bodying and at the end spiriting. Perhaps I may be better understood by saying that the two processes, bodying and spiriting, merge into each other—there is no abrupt break, as between filling and bodying; hence the difficulty of precisely locating the work now under consideration in its proper chapter. One way out of the difficulty would have been to treat both in the same, and another to consider them all as included under a general heading of polishing. The two operations of bodying and spiriting are, however, so well defined—except for the intermediate stage—both in character and purpose, that to have done so would have been to mar the pages of Work, which is singularly free from technical errors. I may also say that what I have called the intermediate stage is not always practised, but the very fact of its being mentioned as part of the course of polishing shows that it is, at any rate, recommended when good work is wanted.

Perhaps a definition of what spiriting off is may help to make the operation clear. Briefly, it consists in washing the bodied surface with methylated spirit alone. This being understood, it is only necessary to say that the final bodying up, or first spiriting, whichever it may be called, consists in gradually reducing the quantity of polish in the rubber, and supplying its place with spirit. In other words, the polish is gradually reduced by the addition of spirit till all the polish has been worked out of the rubber. Thus the rubber may be moistened, first with three parts polish and one part spirit instead of pure spirit; next time equal quantities; the third time three parts spirit and one part polish; while the fourth charging will be with spirit only. Of course, I do not mean to imply that these proportions must be, or in practice are, observed, but the explanation will illustrate the process more clearly than vague general description, so that I hope no one can misunderstand what is intended. At the last the rubber will be almost free from polish, and, as previously, it should be worked till it is dry, or as nearly so as possible.

When this stage has been reached the spiriting proper may begin, and a fresh rubber should be used for this purpose. It need not be a new one, but it should be one which has only been used for spiriting, and should have no polish on it. Instead of having only one covering of rag on its face, it will be better if it has three or four, which can be removed as they dry. If only one cover is used the spirit is apt to evaporate more quickly than there is any occasion for.

Now it will easily be understood that the spirit in the rubber partially dissolves the shellac or body on the wood, or at least that its tendency is to do so. That it does to a very limited extent is undoubted, unless the rubber is made too wet, when there is a danger of not only spiriting and smoothing the surface, but of actually washing away the body. This, of course, would be about as awkward a mishap as could occur, and it must be carefully guarded against. There should be enough spirit just to allow the surface of the body to be softened and smoothed, but no more, and it is almost unnecessary to say that the rubbing should be equal, and not more in one place than in another. As there is hardly any likelihood of the novice erring by using too little spirit, I may venture to say that the less of it the better in the rubber at a time. The rubbing should be gentle at first, becoming harder as the spirit dries off, and, of course, oil must not be used on the rubber face as when bodying. If there is any oil either on the rubber or on the work, the polish cannot be brought up.

If everything has been done correctly the gloss will soon begin to appear, and when it seems as good as it can be got, or is approaching that condition, the rubber ought only to be moved in the direction of the grain, and not across it or with circular motion. The final touches should be given with the soft rubber rag alone, the utmost care being taken not to scratch the surface, which is now softened by the action of the spirit. It will gradually harden, but for a time it should be handled with care, and nothing be allowed to come in contact with it, or it is very likely to be marked. It should also be protected from dust, for any settling on it may be retained by the polish, the lustre of which would certainly suffer.

Now, besides amateurs and novices, this article will no doubt be read by many cabinet-makers, of whom some, no doubt, will be masters, and perhaps dealers in furniture. Those who cannot keep an experienced polisher, or who, being in country places, may not be able to get the work done "out," will, I hope, derive some advantage from a perusal of these articles, to which I would now like to add a word of advice for their special benefit. It is that, circumstances permitting, any polished piece of furniture should be "wiped over" with a spirit rubber an hour or two before it is sent home, just to freshen it up; and if the surface is at all soft, neither packing mats, nor anything else likely to injure it, should be allowed to come in contact with it. The polishing on many things sent from London to the provinces is often not fit to be seen—from mat and other markings—till it has been "touched up" after arrival at its destination.

Notwithstanding all that has been said, it is quite likely that the useful, and almost overburdened, "Shop" columns may have further claims on them by someone asking how a particular kind of wood is to be polished; therefore, let me say that the directions for filling, bodying, and spiriting refer to all sorts; and that anyone finding himself in a difficulty must not merely say that he "can't manage" to polish, or that something is wrong in a general way, but must state as fully as he can exactly what he has done, and what is unsatisfactory in the result, if he wishes either me or any other member of the staff of Work to help him. Vague statements that the polish "did not look nice," or something of that kind, give no grounds to form an opinion on, and as no trouble is spared in answering replies, it is only fair that inquirers should help by making their statements as full and explicit as possible if they wish for advice. These remarks apply specially to the subject I have in hand, viz., polishing, but are more or less applicable to all.

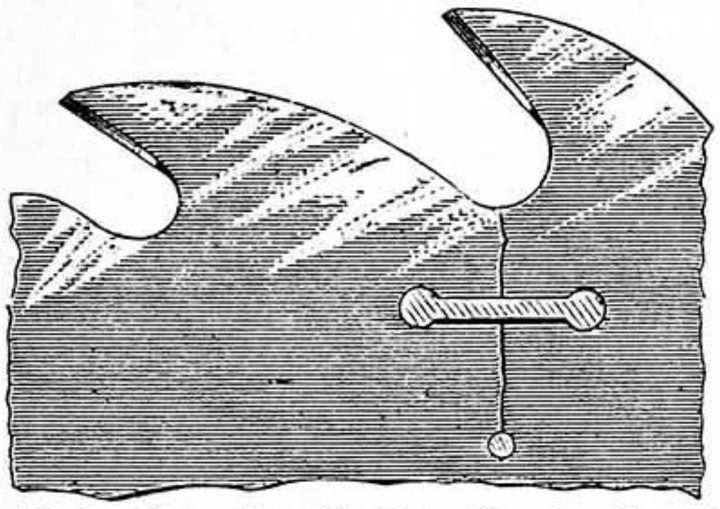
In future papers, staining and other processes which are incidental to the polisher's craft will be fully discussed, and the next one will be on an easier method of finishing than by spiriting off—though, I warn readers, not so good a one—viz., the process known, among other names, as that of "glazing."

HOW TO REPAIR A CRACKED CIRCULAR SAW.

BY M. POWIS BALE, M.INST.M.E.,
A.M.INST.C.E.,
Author of "Saw Mills: their Arrangement and Management," etc.

Cracks in circular saws may arise from a variety of causes, such as too hard a temper, striking a nail, saw bending in work, improper shape or size of the tooth for the wood being cut, etc.

Teeth with angular gullets are more liable to crack at the roots than those with rounded gullets, more especially if the gullets are not sufficiently large and deep to allow of a ready escape for the sawdust. If the crack is only a short one—say two or three inches in large saws—it may usually be stopped from extending by drilling a small hole at the extremity of the crack. To do this, a drill of the hardest possible temper will be required, and for this we have found Mushat's special steel suitable.



Mode of mending Crack in Circular Saw.

The drill must be run very slowly and be well lubricated. The hole should be slightly countersunk on either side. For saws up to 3 ft. diameter a hole of about ¼ in. diameter will generally be suitable; with saws above 3 ft. diameter about a ⅜ in. hole.

The illustration represents a portion of a saw showing a crack with a stop-hole drilled at its extremity, and with a yoke fitted across the crack. The stop-hole in this case is carefully plugged up. The yoke is made by drilling two holes, one at either end of the yoke, and by drilling and cutting away the

intermediate metal, as shown in the sketch. The opening should be countersunk, and a piece of steel plate carefully fitted and riveted into the place. The yoke must now be ground down until it is of exactly the same gauge as the rest of the saw and perfectly smooth, so that when the saw is set to work there should not be undue friction at this point. If the saw is a large one, and the fracture extensive, two yokes will probably be required.

INTERNAL SANITARY FITTINGS OF HOUSES.

BY W. R.

WATER-CLOSETS.

IMPROVED "BRAMAH VALVE" CLOSET—THE PAN CLOSET—WASH-DOWN CLOSETS—WASH-OUT CLOSETS—PEDESTAL WATER-CLOSETS—ARRANGEMENT OF SEAT.

Various Forms of Water-Closets.—One of the most important articles in a house, from a sanitary point of view, is the water-closet, and therefore I will give it precedence in this paper.

The water-closets usually fixed by plumbers during the last generation were the "Bramah Valve" and the "Pan" Closets. The former was invented by John Bramah about one hundred years ago, and has proved, when properly constructed and fixed, a most efficient machine.

The Improved "Bramah Valve" Closet.—Many improvements have been made upon the "Bramah Valve" closet, and Fig. 1 represents a pattern which may be relied on. The pan is a large one, and is connected to a small valve-box by means of a gun-metal flange; to this flange is attached a valve, about 3½ in. or 4 in. in diameter, which, when closed, presses tightly against an indiarubber ring sunk in the flange, thus forming a tight joint, and retaining a certain amount of water in the basin. Fig. 2 shows the action of the valve. When the handle is raised, it lifts a lever, which works the tumbler and throws back the valve; at the same time another lever connected to the stool-cock is raised, and, by opening the cock, allows the water to enter the pan. The closet is flushed by means of a 1¼ in. or 1½ in. lead pipe (the size depends upon the head of water available), which enters the back of the pan, the water being distributed over the basin either by a copper fan or a flushing rim.

The Flush.—The flush may be supplied either by a cistern or by a constant head of water. In the former case the stool-cock and regulator, shown in Fig. 1, are not needed, the water being sent down into the closet by lifting a round valve in the cistern by an arrangement of cranks and wires working from the handle to the cistern; the after-flush or water to be retained in the pan being supplied by the water contained in the pipe after the valve in the cistern is closed. Flushing and syphon tanks are not suitable for this class of water-closet.

When a constant pressure of water is in the service-pipe, the stool-cock has to be used; and to obtain a proper after-flush, a regulator—such as may be seen at A, Fig. 1—is fixed so as to allow the lever attached to the stool-cock to regain its place slowly, the amount of time it takes to do so, and therefore the amount of water in the pan, being regulated by a small cock at the top. The regulator should be lubricated with glycerine. An overflow pipe is formed in the side of the pan, and is connected to the valve-box at the *back* of the valve by a 1½ in. lead **P** trap, as may be seen at Fig. 2. If the overflow enters in front of the valve, there is great danger of its becoming choked by the discharges from the pan. The flush should be so scattered over the pan as to send a certain amount of water through the overflow every time.

Ventilation.—Of very great importance is the ventilation of the valve-box for getting rid of the foul gas which is sure to collect between the water-seal of the trap and the valve, and also to prevent the syphoning out of the overflow trap.

A 1½ in. lead pipe should be carried from the valve-box at a sharp rise to the external air, and left open.

Trap.—The best trap to use under this closet is a 4 in. drawn lead **P** or **S** trap as may be required, taking care to thoroughly ventilate it.

The Pan Closet.—This wretched contrivance, shown at Figs. 3 and 4, has been most extensively fixed in the past, and is still being fixed by some benighted tradesmen, especially in rural districts. The only advantage which it can possess, to my knowledge, is a clean pan, and that is but outwardly, for anyone who has taken one apart after it has been in use some time, can testify to its disgusting uncleanliness.

The earthenware pan is set on an iron container of large dimensions, in which works a copper bowl or pan (from which the closet derives its name), moved by a lever in a similar manner to the valve-closet. Fig. 3 shows a section of the apparatus with the pan open. The service-pipe enters at the back, and is usually a ¾ in. lead pipe, which is, of course, much too small for the flushing it has to do. When the closet is used and the handle raised, the copper pan is thrown back, and the contents are precipitated into the iron container beneath, and thence into the trap, splashing all over the interior, and rendering it very foul in a short time. Very seldom do we find this container ventilated; and if it is, it is generally by means of a small hole in the top of it, open to the air of the apartment. Thus, at every flush the air which has been in contact with this foul interior of the container for some time is forced out into the room. To make matters worse, this defective appliance is usually accompanied by a lead **D** trap fixed under it. Under no circumstances should these closets be used.

Wash-down Closets.—Far cheaper and better than the Pan closets are the earthenware closets, which have become so generally used of late years. These closets are simple to fix, and, as they possess no working parts, are not liable to get out of order. Figs. 5 and 7 show two patterns of these closets, and Figs. 6 and 8 sections of the same, and most all others are modifications of these.

Fig. 5 is a wash-down, and may be considered as merely a trap with the mouth enlarged to form a pan. The back is made almost vertical, so that soil shall not be so liable to touch it, but fall straight into the trap.

This, however, does not always happen; and when it falls on the dry pan, it stays there, and defies the hardest flushing to thoroughly remove it. This is the one disadvantage of this pattern, but it may be overcome by flushing before using the appliance.

The Flush.—The service-pipe, which enters the back of the pan, should not be less than 1¼ in. in diameter, and should have at least 6 feet head of water, and be free from sharp bends.

A small stream of water is let into the pan by a little hole below the flushing rim, which falls on the paper in the pan, damps it, and sends it down to be carried off by the heavy flush. Flushing and syphon cisterns are very suitable for use with this pattern water-closet.

Wash-out Closets.—Fig. 7 is a wash-out pattern, and by its construction always holds a certain amount of water in the pan, as may be seen in the section, Fig. 8, thus preventing the pan from becoming foul.

The Flush.—The disadvantage of this pattern is that the two gallons of water which are allowed by the various water companies for each flush of a water-closet is not sufficient to thoroughly carry all soil, etc., through the trap, and thus a source of bad smells and probable stoppage may arise. With three gallons or more the case is different. The flush first strikes the water in the pan and throws it out, and the latter part of the flush rushes over the pan in a sheet, possessing great cleansing power and carrying all before it.

This only occurs if the service-pipe is not less than 1¼ in. in diameter and has a good fall, and is properly brought into the pan without any sharp bends. An after-flush chamber is sometimes made in the back of the pan, into which a certain amount of water is carried by the flush, and finds its way gradually into the pan through a small hole, after the flush has ceased. This is necessary when a flushing or syphon tank is used, as the water passes through the pan with great velocity until nearly the last drop, thus leaving the pan and possibly the trap partly empty. If, however, a cistern with a round valve and service-box be used, the water which is in the pipe after the valve is closed is quite sufficient to refill the pan. Regarding this same round valve and service-box arrangement, some plumbers make egregious mistakes. They imagine that the larger the service-box and the larger the air-pipe attached thereto, the greater will be the flush. This is true if the valve be one of Bell's, and the service-box is full of water, for then, when the valve is raised, the pressure of the water in the cistern is removed from the service-box, and it is necessary to allow the pressure of the atmosphere to bear on the water in the service-box through the air-pipe, which should then be the same bore as the service-pipe.

Service-Box Ventilation.—When a round valve is used, the only use of the service-box is to connect the valve to the service-pipe, and, in fact, may be regarded as part of the pipe itself; and so, when an air-pipe is connected with it and the valve is raised, the rush of water to the pan is retarded and impeded by the air drawn through the air-pipe by the water. The only use of an air-pipe with this arrangement is to allow the water, with which the service-pipe is filled after the valve is closed, to dribble slowly out into the pan. A small piece of copper or lead pipe closed over the top, and then pricked with a very fine bradawl, will be found quite sufficient. I have done many a satisfactory job by removing the service-box and round valve, and, after making the bottom of the cistern good, wiping a 1½ in. spindle-valve, such as is used for a pump, directly on to the service-pipe, after having previously tapped the side of the body to receive a piece of ¼ in. copper pipe, which has been brought to the top of the cistern and treated as before described.

Pedestal Water-Closets.—Earthenware

water-closets are often made with the pan and trap combined in one piece, thus forming a kind of pedestal which will stand alone. No elaborate construction of woodwork is needed for these closets, but merely a hinged seat, the pan being left bare all round, thus affording no chance for unseen accumulations of dust or dirt. Fig. 9 shows the best method of fixing this class of water-closet. The floor may be of tiles, or covered with lead, so that it may be well and frequently washed. The flush is obtained from a syphon cistern overhead, which should contain three gallons of water, and the pan is provided with an after-flush chamber. The disadvantages attached to this closet are: the impossibility of getting at the trap without taking the whole closet down, and thus exposing the house to the dangers of drain air; and in order to make the outside symmetrical to the eye, the trap is often badly formed internally, and presents odd angles and sharp turns to the passage of the soil.

Points in the Selection of a Water-Closet. — Great care should be exercised in the selection of a water-closet, the following points being closely looked to:—If possessed of working parts, see that no more than possible of such parts are liable to contact with the soil, and see that the tumbler arrangement is properly fitted; see that the flush is so arranged as to scour (not merely wet) every part; see that a large service of water is exposed to receive the soil; and if a trap be attached, see that the same is well formed and self-cleansing. The joint of the water-closet to the trap in the case of a valve-closet may be made by good red-lead stopping, or by an india-rubber ring. In the earthenware closets the pan should be set on the trap in red-lead stopping, and the trap should be joined to the soil-pipe either by a bandage joint or by flanges, in the case of a P trap; and by an indiarubber flange or ring when an S trap is used. Brass screws should be used to fasten the appliance to the floor. The connection of the service-pipe to the inlet-arm of the pan is best made with a stout indiarubber socket or connector, shown in section at Fig. 10.

Lead Safe.—A lead safe or tray must be fixed under every water-closet to prevent damage to the ceiling below, or a mess about the apartment, in case of an accident—such as the service-pipe or stool-cock leaking, or the pan overflowing. This safe should be the entire size of the space under the closet seat, and at least 3 in. in height, and should be drained by a $1\frac{1}{2}$ in. lead pipe, taken straight through the external wall, so as to show when anything is wrong. The end may be covered by a hinged copper flap, to prevent a draught blowing into the apartment.

Arrangement of Seat.—This requires attention. The riser should be hinged at one side, so as to open like a door. The seat also should be hinged, so that it can be thrown back; thus the whole space can be easily and frequently got at and cleansed. No covering, flap, or other cover should be allowed, for this often causes a nuisance by bottling up a bad smell for the benefit of the next comer. Some may object to this by saying it looks bad, but if the water-closet is not clean, it is the fault either of the apparatus or of the users. If the former, change; if the latter, let them change their habits and be clean.

Position. — As regards the position of water-closet apartments in a house, they should always be built on an external wall, or, better still, in a separate wing or off-set. The windows should be made to open properly, and, in addition, thorough means of ventilation should be provided; an opening of 24 square inches for every 1,000 cubic feet of air space being provided for inlet, and a corresponding opening for outlet, both connected with the external air.

Thus, every means should be taken to render these very necessary appliances harmless to health, leaving it to the users to keep them in that state, remembering that "Cleanliness is next to Godliness."

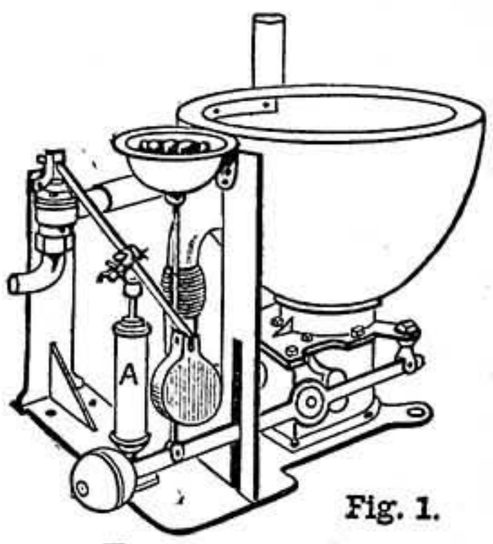


Fig. 1.

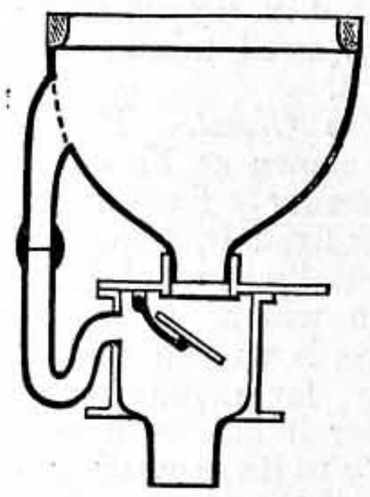


Fig. 2.

Fig. 3.

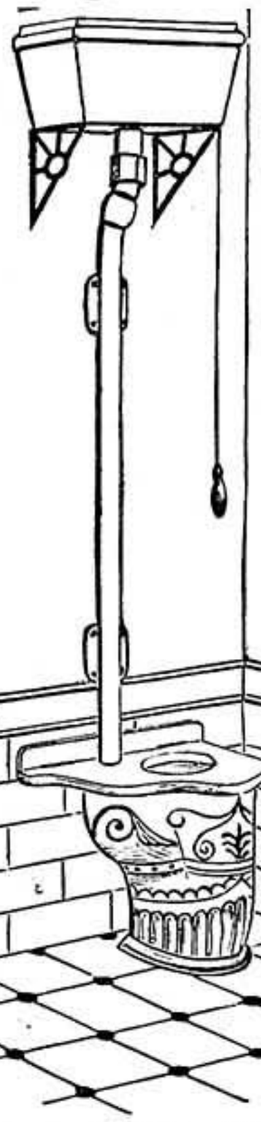


Fig. 9.

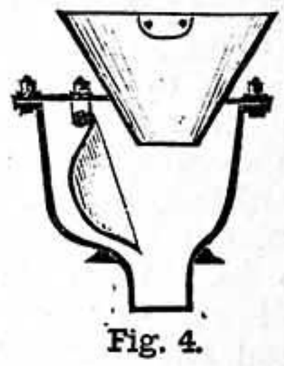


Fig. 4.

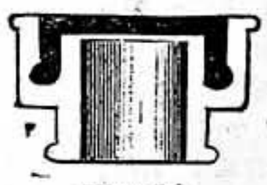


Fig. 10.

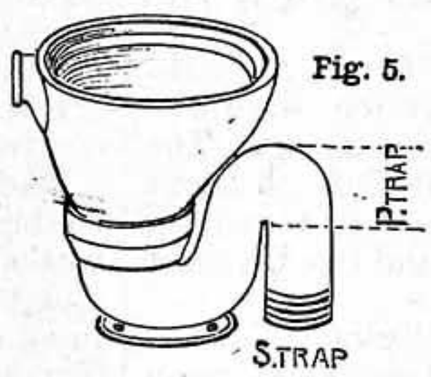


Fig. 5.

Fig. 7.

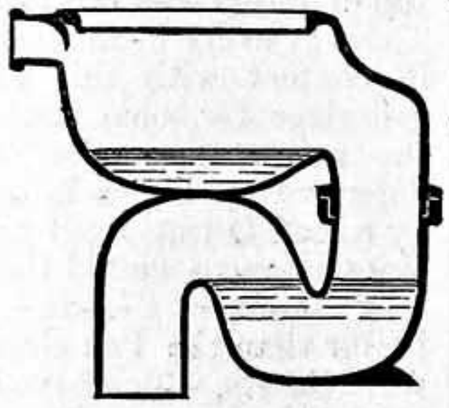


Fig. 8.

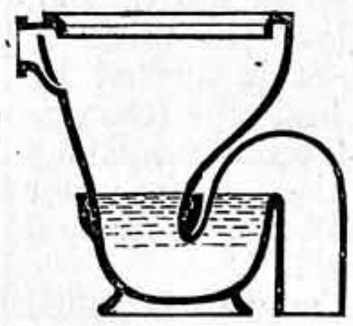


Fig. 6.

Fig. 1.—"Bramah Valve" Closet—A, Regulator. Fig. 2.—Section of ditto, showing Valve partly open. Fig. 3.—Pan Closet. Fig. 4.—Section of ditto, showing Pan thrown back. Fig. 5.—Wash-down Closet. Fig. 6.—Section of ditto. Fig. 7.—Wash-out Closet. Fig. 8.—Section of ditto. Fig. 9.—Method of fixing Combined Pan and Trap. Fig. 10.—Indiarubber Connector.

ARTISTIC LITHOGRAPHY.

BY MISS ADA J. ABRAHAM.

Chalk Work on Stone.

PRACTISING WITH CHALK—PAD—POINT OF CHALK—CORRECTIONS ON STONE—SCRAPING TINT—LIGHTENING TINT WITH NEEDLE—SOLID INK WORK—MIDDLE TINTS—WORKING TINT INTO STONE—TRANSFER OF CHALK WORK—SPLASH WORK.

FOR practising with the chalk, rule some squares on a grained stone, the same as before, and get accustomed to the working of the chalk by drawing various tints, such as Figs. 24, 25, 26. A small box should be used to put the chalk cuttings into, and bits of the chalk which break off should never be allowed to remain on the stone, or they would settle on it and not be easily removed.

It is better to use a pad instead of the board as a hand-rest for chalk work, and the student will find he can very often sharpen the chalk on the paper by twirling it round from right to left, and left to right, instead of continually cutting a point.

The finer the point is made, the finer the tinting will be, and the first tint drawn on the stone always tells in the work, and is therefore of much more importance than any subsequent ones. In drawing the outline on the stone the point of the chalk can be used, but for all flat tinting it is much better to work on the side.

Should a mistake be made in the tint it would not be well to scrape it, as it would destroy the surface of the stone, and show a different texture in printing to the rest of the tint. Fig. 27 shows where a portion of the tint has been made too dark, and scraped away without due caution.

If in making a tint any small portion of the chalk dots appear darker than the rest, they may be sometimes removed by placing the point of the chalk on that spot and suddenly lifting it up, when the chalk will adhere, and come off the stone. In this way a tint may be considerably lightened, but should never be worked on again, and unless this is carefully done, white specks will appear; and, also, after any part of the tint has been scraped, no future work would print if drawn in the same place, either on a polished or grained stone.

It is best to use the point of the needle to lighten tints, in the same way as it is used for stipple work; and it will be naturally understood that a tint can always be made darker, but very seldom lighter, satisfactorily. In fact, lithography is an art where

mistakes should never occur, for they invariably show more or less.

Any solid or ink work should be done after the chalk is finished, in order not to smear the drawing, and if in colour work the ink is put on first, care should be taken not to lift it off with the chalk, especially where the solid and chalk join. Figs. 28, 29 show good and bad methods of joining solid to chalk work. A ball (Fig. 30) is also excellent practice for shading.

A good rule to be observed in chalk drawings is that middle tints should be drawn as they are required to appear when finished, light tints a little darker, as chalk work loses its strength in printing — especially in light tints — unless worked well into the stone, which will make it appear a little darker than it really is; and dark tints should be worked a trifle lighter than required, as they sometimes clog up in printing, and so print darker, or even solid.

In chalk work the tint must be always worked well into the stone, and not merely put on the surface, else the grain will not hold the chalk sufficiently to print. Figs. 31, 32 give examples of the same tint, or rather the same tint as it appeared before it was etched, only in Fig. 31 it was worked firmly into the stone, and in Fig. 32 it was merely put on the surface. Chalk does not stand so well in printing as stipple work—that is, not so many good impressions can be obtained from it—as the artificial grain given to the stone wears away the work quicker than a polished stone would do; and also chalk not being so strong as the liquid ink, it is more affected by the acid. In the same way in making corrections on a grained stone after it has been etched, the utmost

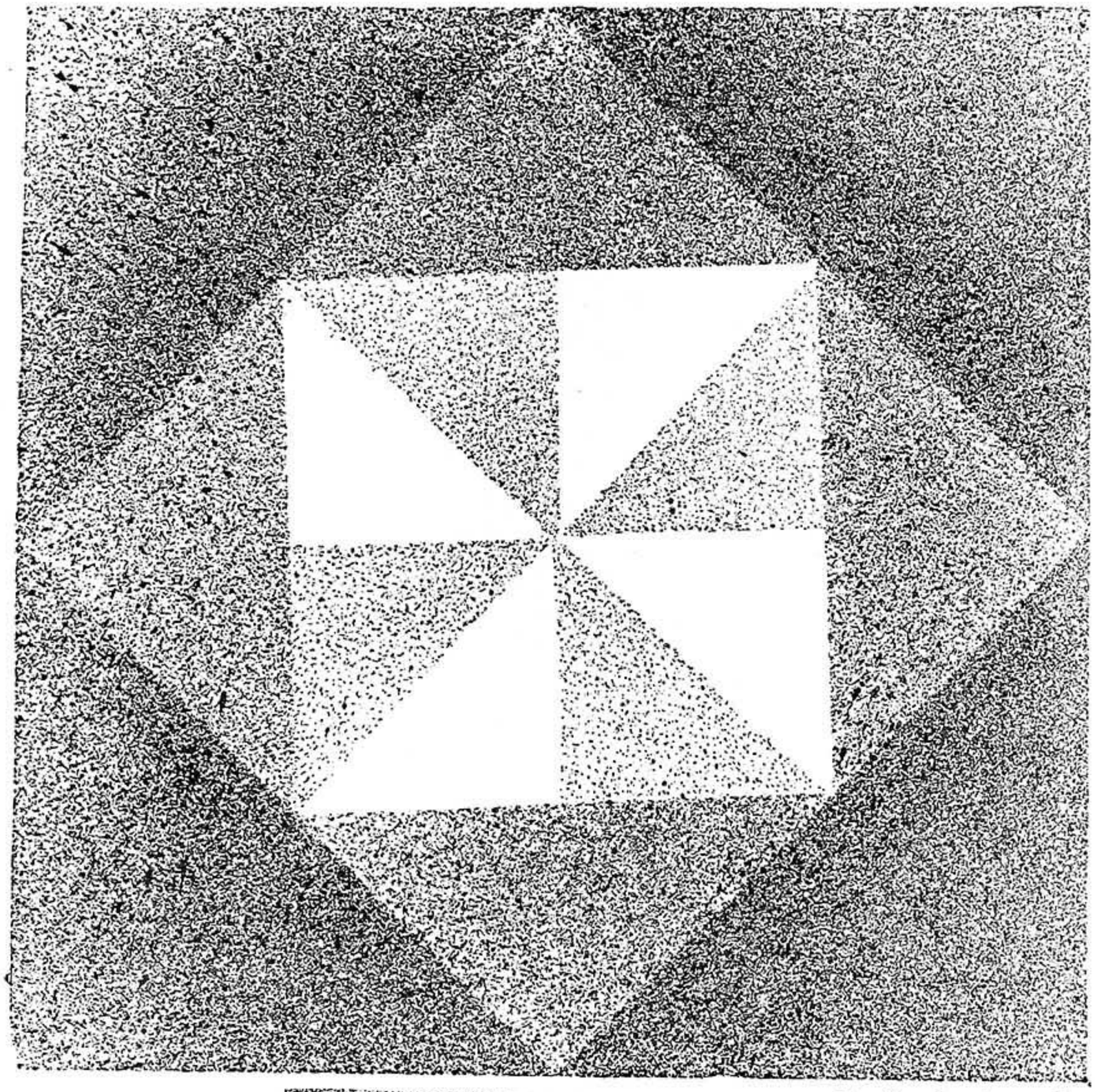


Fig. 33.—Specimen of Splash Work.

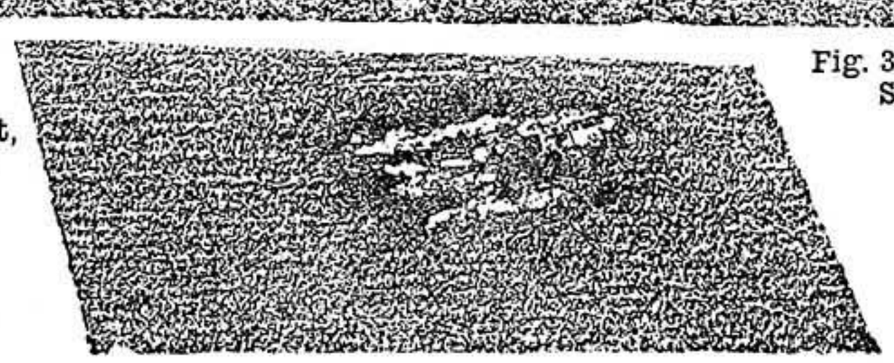


Fig. 27.—Chalk Tint, corrected badly.

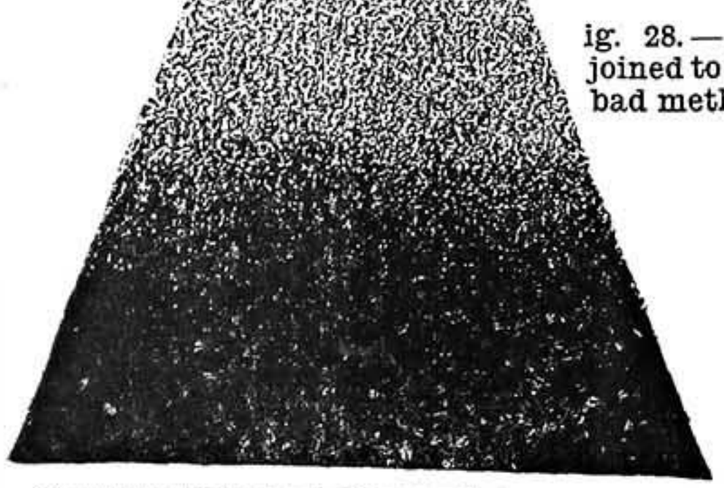


Fig. 28.—Chalk Tint joined to Solid Body: bad method.

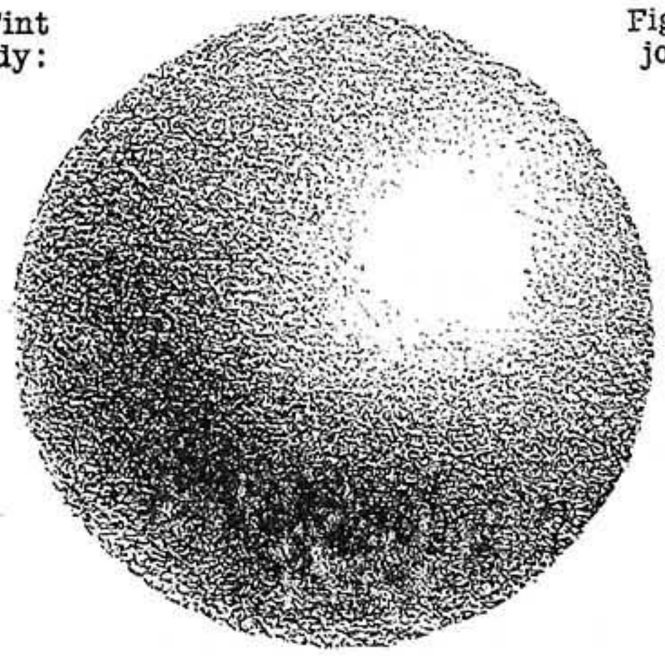


Fig. 30.—Ball shaded in Chalk.

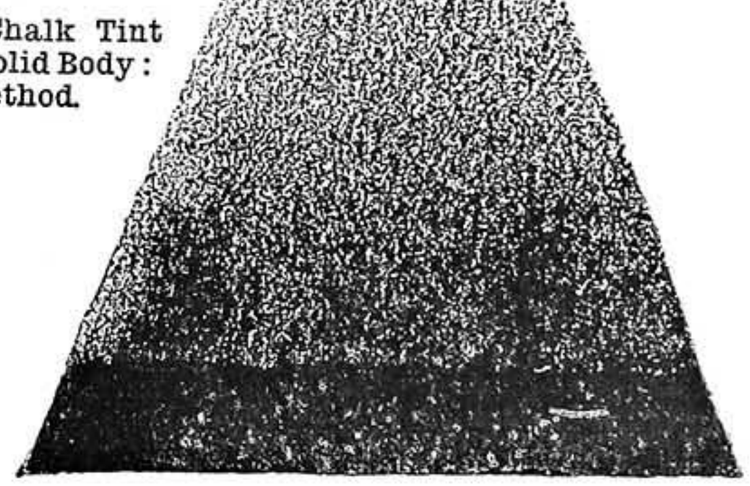


Fig. 29.—Chalk Tint joined to Solid Body: good method.

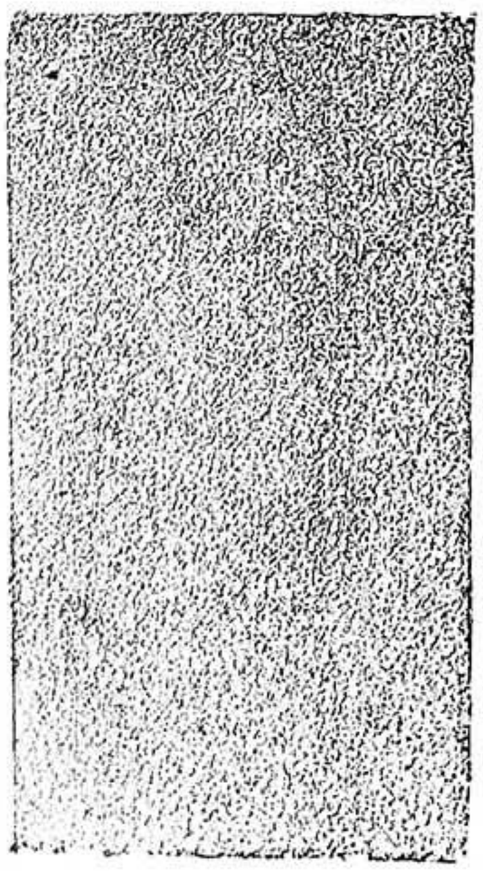


Fig. 31.—Example of Good Tint worked well into the Stone.

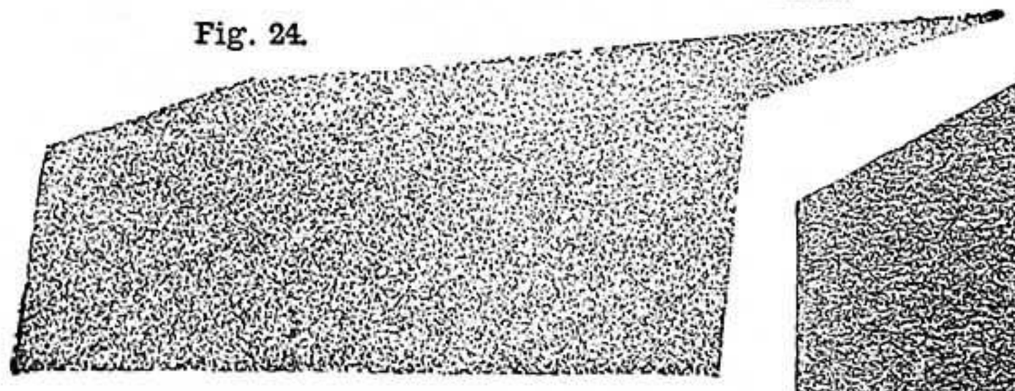


Fig. 24.

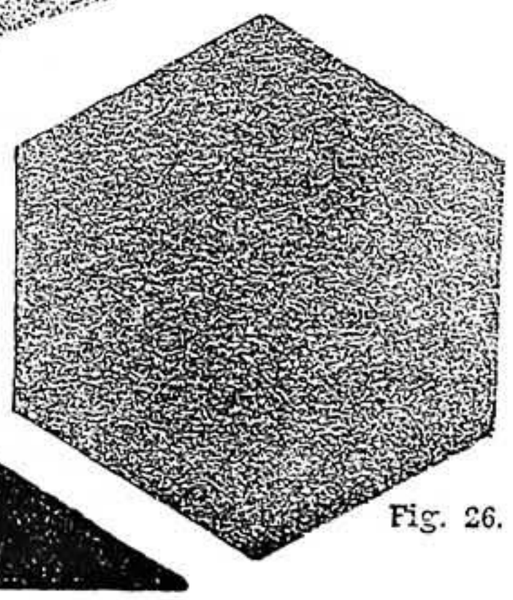
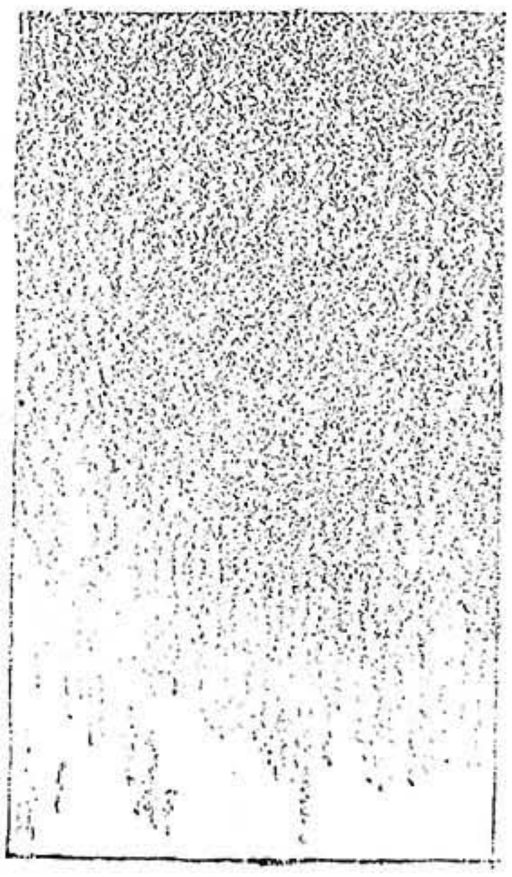


Fig. 26.

Fig. 25.

Figs. 24, 25, 26.—Various Chalk Tints.

Fig. 32.—Result of same Tint as in Fig. 30, when only worked on Surface of Stone.



care must be used, as if done in chalk it will not hold sufficiently to print, and therefore if a tint is required to be darkened it must be stippled with the pen, and that very judiciously for it to hold in printing. If the tint is required to be lightened it might be etched slightly with the acid; but it cannot be impressed too strongly upon the artist how carefully this must be done, else the tint will entirely disappear if too strongly etched, and may work up again if not etched sufficiently.

Chalk work is much more difficult to transfer than stipple, and is never done if a great number of good impressions are required. It is very good, however, for such work as bill posters, which could not be worked quickly enough in stipple, and also for artistic work, as it gives a softer effect; but for Christmas cards, almanacs, and work required to be transferred, stipple is the only satisfactory means of working.

Splash work (Fig. 33) is a very quick method of obtaining an even tint with very little trouble, and is very useful at times in giving a texture which cannot be obtained in any other way. It is done by having the stone flat, and gumming over that part where the tint is *not* required, or taking a sheet of paper having the outline of the tracing on it, then cutting out those parts where the tint *is* required, and laying it on the stone—it must be perfectly flat, and one or two lead buttons or pennies will keep it in position; it must not be lifted in any way or the ink will get underneath. Then fill a small tooth-brush with some ink, and, by holding another and rubbing the two brushes together, the ink will fall on the stone in dots. A small comb and brush—or a brush drawn across a penknife—would answer the same purpose. The closer the brush is held to the stone the nearer together the dots will fall, and the farther away the brush is held the larger the dots will become, and the coarser and more uneven the tint; also the more ink there is in the brush the coarser the dots will be.

If a dark tint is required, it should be done gradually, allowing the ink to dry before going over the same ground again, or the dots will all run together. It being impossible to lay the dots in any decided place in splash work, it should never be worked on faces or in any important parts of the picture; but it makes an excellent texture for such work as the foreground in a landscape or the background of a room, and can be done on either a grained or polished stone.

Much more could be written about the ways and means of working upon stone, but space does not permit. I trust that what has been already said will be a slight assistance to the student, and will, therefore, hasten to our next subject of practical work.

OUR GUIDE TO GOOD THINGS.

*** *Patentees, manufacturers, and dealers generally are requested to send prospectuses, bills, etc., of their specialities in tools, machinery, and workshop appliances to the Editor of* WORK *for notice in "Our Guide to Good Things." It is desirable that specimens should be sent for examination and testing in all cases when this can be done without inconvenience. Specimens thus received will be returned at the earliest opportunity. It must be understood that everything which is noticed, is noticed on its merits only, and that, as it is in the power of anyone who has a useful article for sale to obtain mention of it in this department of* WORK *without charge, the notices given partake in no way of the nature of advertisements.*

46.—LOWTH'S IMPROVED PATENT "UNIQUE" HONEY EXTRACTORS.

THE Improved Patent "Unique" Honey Extractors, invented and patented by Mr. T. Lowth, Riseholm, Lincoln, are such as appear to merit the attention of readers of WORK who take an interest in bee-keeping. The "Section Extractor," shown in Fig. 1, is especially adapted for extracting honey from sections, and is fitted with cases for loose combs. It extracts the honey from three sections, and the can, which is 10 in. in diameter, will hold 10 lbs. of honey. A perfectly steady and easy revolution is produced by

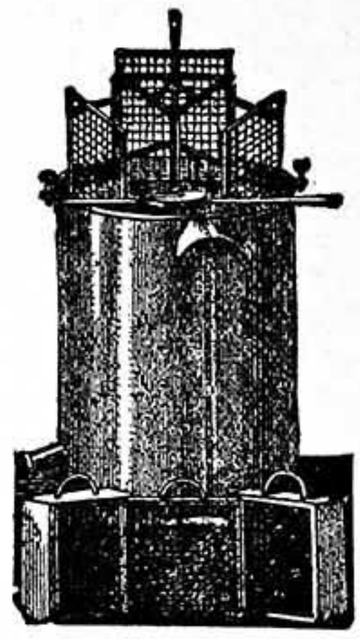


Fig. 1.—Lowth's Section Honey Extractor.

the detachable cages, which cause the ejection of the honey from delicate combs, such as are usually found in sections, with the least possible labour and waste. The inventor claims that the machine will be most useful and handy, especially when a good harvest of section honey is secured, for extracting the contents of unevenly built-out, and therefore unsaleable, sections, thereby preserving the combs and producing the finest samples of extracted honey in saleable form or for exhibition purposes, the quality and brilliancy of the honey being preserved. Thus, by using this extractor, the honey is saved from becoming candied by being left in the sections, and clean built-out combs are provided, which are valuable for securing the early spring crop. Frames or sections, containing honey to be extracted, should be carefully uncapped, placed in cages, and a few revolutions given to eject the honey; the combs can at once be returned for bees to refill, or preserved for future use. Loose combs should be placed in cases provided, and the honey extracted in the same way. The price of this machine is 7s. 6d., and can be sent post free for 9d., in addition to the cost.

The "Bar-Frame Extractor," shown in Fig. 2, is made entirely in metal, with movable folding

Fig. 2.—Lowth's Bar-Frame Honey Extractor.

cages, and combines in itself all the latest improvements in extractors. By its aid honey is extracted at one operation from three standard or shallow frames, 1 lb. or 2 lb. sections, and loose combs from skeps. The combs are held firmly in position during the process of extraction, thus preventing any breakage of the comb or mess. Each cage can be easily removed for inspection of combs, uncapping, or putting in fresh combs when desired. Brood combs, subjected to the action of the machine, are not splashed or chilled. The internal arrangement of the extractor forms a light running machine, imparting considerable centrifugal force to the revolving cages. The necessary speed for ejecting the honey can be at once obtained, thus saving much time and labour expended in the operation when carried out by other means. The price of this extractor is 21s., or 22s. 6d. if packed in case. Any size machine can be made to order.

The machines above noticed may be described as being thoroughly well made, portable, easy-working, and simple in construction. The internal parts can be promptly removed for cleaning, if desired. The special feature in the Bar-Frame Extractor is its capability for all-round work—namely, the extraction of honey from frame sections and loose combs. The internal arrangement of the cages is such that the honey is more easily ejected from the combs at a lower rate of speed, entirely dispensing with cog-gearing, which is absolutely unnecessary in this extractor. The movable folding cages, moreover, do away with all risk of the comb being broken either in or out of the machine. The covering-in of the revolving parts at the top prevents splashing and chilling of brood combs while the machine is in motion, so that there is no need for a top cover. The height of the cylinder, which forms the case, is 2 ft. 2 in., and it is 17 in. in diameter. About 35 lbs. of extracted honey can be held under the cages. The cylinder forms a useful vat or receptacle for honey when not in work.

47.—"WOODWORK."

This is the brief title of a handy little volume, designed to meet the requirements of the Minute of the Science and Art Department on Manual Instruction. It is written by Mr. George St. John, Handsworth, Birmingham. It is published by Messrs. William Blackwood & Sons, London and Edinburgh, and its price is 1s. It is intended to point the way to the establishment of classes in manual instruction in elementary schools, and to show the cost of the necessary outfit in tools and benches, always supposing that the school in which such a class may be established is possessed of the necessary accommodation for a workshop. The cost, as to plant, etc., may thus be easily reckoned up; but what if the elementary school is without any adjunct that can be utilised as a workshop, and the School Board, or school managers, as the case may be, have to provide the wherewithal for the payment of an efficient instructor in the person of a skilled artisan, for it will be utterly useless to place the boys at the mercy of an unskilled amateur? "My Lords"—I am referring to the Minute—touch but lightly on the teaching part of the business. "The instruction *may* be given by one of the regular teachers of the school, *if he is sufficiently qualified;* if not, he must be assisted by a skilled artisan." No very great effort of brain power was required to evolve this permissive remark. There are a few teachers who could do the work, as I know, but in the great majority of cases the services of the skilled artisan will be a *sine quâ non*. Again—"The work of the class will be examined by the local inspector of the Department, accompanied, *if necessary*, by an artisan expert on the occasion of his visit to examine in drawing." Which shows that "my lords" are a little bit doubtful about the competence of the local inspectors. The matter given in the book itself is excellent, thoroughly practical, and sufficient for all elementary purposes; but the bench vice, shown in the engraving of the carpenters' bench in page 31, is an ancient form, and by no means convenient to work. There are as cheap and better forms in existence. It is to be hoped that the present volume will meet the purpose for which it was designed, and find favour, in the bargain, with the large body of amateur wood-workers. Its value in schools, however, would seem to turn more upon some better support than is already given to the subject of elementary technical education by the Education Department.

THE EDITOR.

SHOP:

A Corner for Those who Want to Talk It.

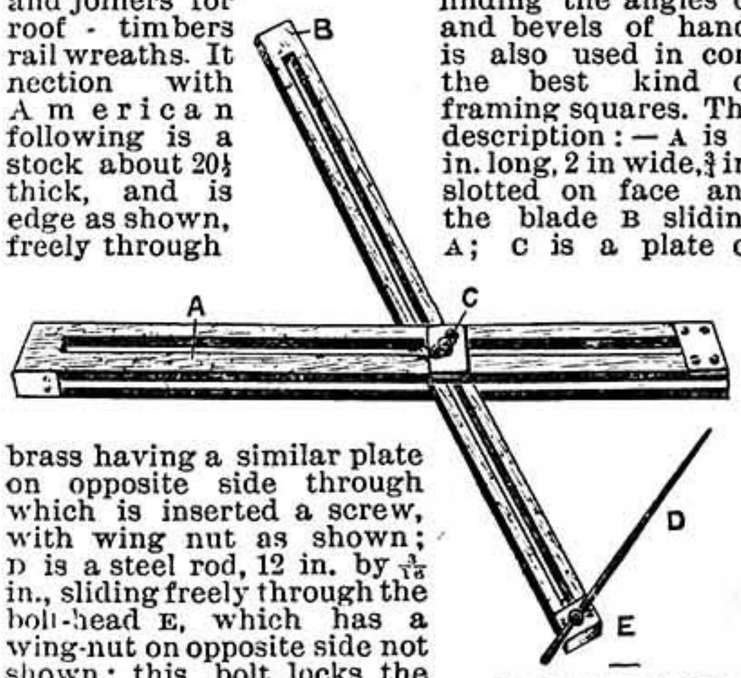
*** *In consequence of the great pressure upon the "Shop" columns of* WORK, *contributors are requested to be brief and concise in all future questions and replies.*

In answering any of the "Questions submitted to Correspondents," or in referring to anything that has appeared in "Shop," writers are requested to refer to the number and page of number of WORK *in which the subject under consideration appeared, and to give the heading of the paragraph to which reference is made, and the initials and place of residence, or the nom-de-plume, of the writer by whom the question has been asked or to whom a reply has been already given. Answers cannot be given to questions which do not bear on subjects that fairly come within the scope of the Magazine.*

I.—Letters from Correspondents.

Rate of Circular Saw. — A. R. (*Scorrier*) writes:—"In my letter (see WORK, No. 116, page 187), wrongly ascribed to A WOODWORKER, it is *Woodworker, and not myself*, who thinks *that the speed of a circular saw and feed of timber may be reduced in proportion to the power, and be an advantage.* I omitted to put this conclusion of WOODWORKER'S into italics in my letter on page 187.'

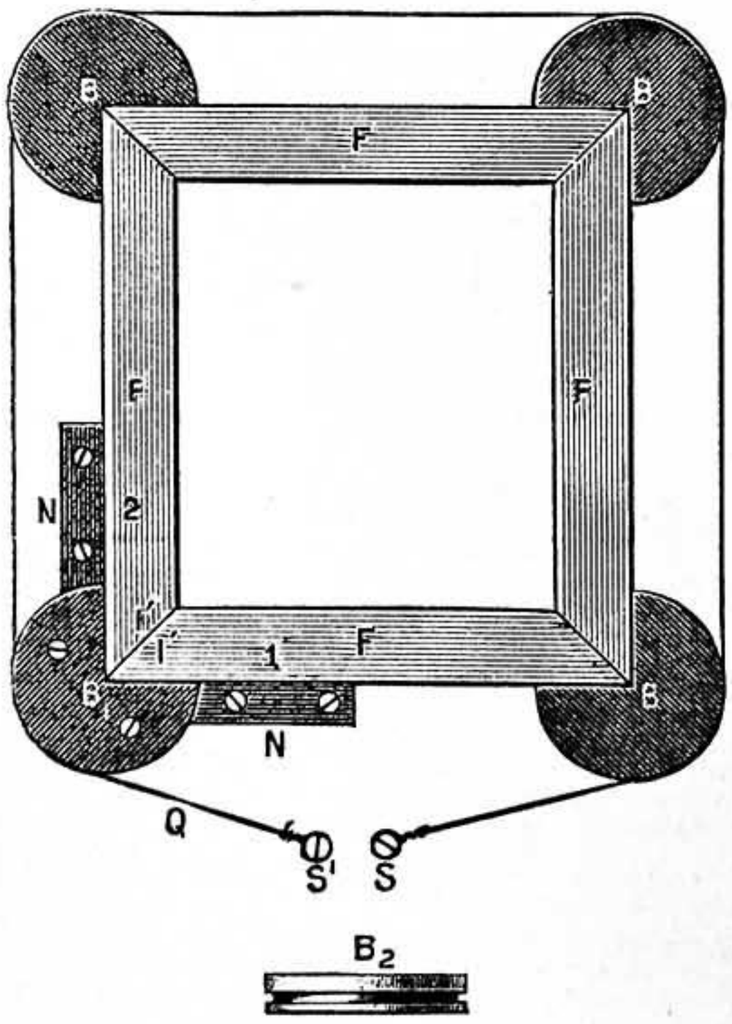
Instrument for Bevels, etc.—J. S. (*Londonderry*) writes:—"The following is a sketch of an instrument used in the United States by carpenters and joiners for finding the angles of roof-timbers and bevels of hand-rail wreaths. It is also used in connection with the best kind of American framing squares. The following is a description:—A is a stock about 20½ in. long, 2 in wide, ¾ in thick, and is slotted on face and edge as shown, the blade B sliding freely through



Instrument for Bevels.

brass having a similar plate on opposite side through which is inserted a screw, with wing nut as shown; D is a steel rod, 12 in. by $\frac{3}{16}$ in., sliding freely through the bolt-head E, which has a wing-nut on opposite side not shown; this bolt locks the steel rod in any position, and by unscrewing the wing-nut the rod can be projected out to the full length (12 in.), and can make a complete revolution round E. I shall feel obliged if some correspondent of WORK (and I know there are some in the United States) would describe how this is used."

Picture-Frame Cramp.—S. C. T. (*Knutton*) writes:—"I am sorry to have given you the trouble of returning my first letter for lack of clearness, but



Picture-Frame Cramp.

will endeavour to do better this time. The contrivance is for gluing up picture frames. First take the two pieces 1 and 2 (as shown in diagram), glue the joints 1', 1', and put them in the corner, fastened down to the floor (marked B N), and squeeze them together. Treat the other joints in the same way, placing the three pieces marked B on the joints as shown. Then fasten a piece of strong cord (marked Q) at S', and pass it round the circles, pulling as tight as possible, and tie at S, not letting the string go looser. The pieces should be constructed as follows:—B, B, B, B are circles of wood, about 4 in in diameter (size is immaterial), 1 in. thick, with a groove turned (as shown) near the bottom edge (as shown at B_2); each circle has a quarter of a circle cut out of it after turning. One of the blocks, marked B', is fastened to the floor, or a level table, by screws, and N, N are two slots of wood same thickness as circles, and about 4 in. long, fastened also to the floor; S', S are two screws let into the floor to fasten the two ends of cord (Q) to. The picture frame should be left in the 'stocks' all night, and then next morning take it out, and it will be found quite firm; then saw a slit with a fine saw through the angle of each corner, and, having glued a piece of match-box, put it in the slit; when hard, trim off, and it will be found quite strong enough for small frames. For large frames, of course, ordinary methods are adopted."

Repairing Set-Pan or Copper.—T. W. P. (*No Address*) writes:—"Sometimes a cast-iron set-pan or copper will burn through in one small place, perhaps, which may be a flaw in the casting, or a place subject to more heat than other parts of the pan. A temporary method of stopping this may be of use to some fellow-readers, who perhaps do not want the trouble and expense of a new pan. Take a brass shank button, and carefully rimer the hole in pan till the shank will just pass through. Cover the back of button thickly with white-lead; press the shank through the hole, and wedge on the outside of pan with a small taper nail, which will draw the button quite close to the pan, making a good sound job, which will last for months, and perhaps for years."

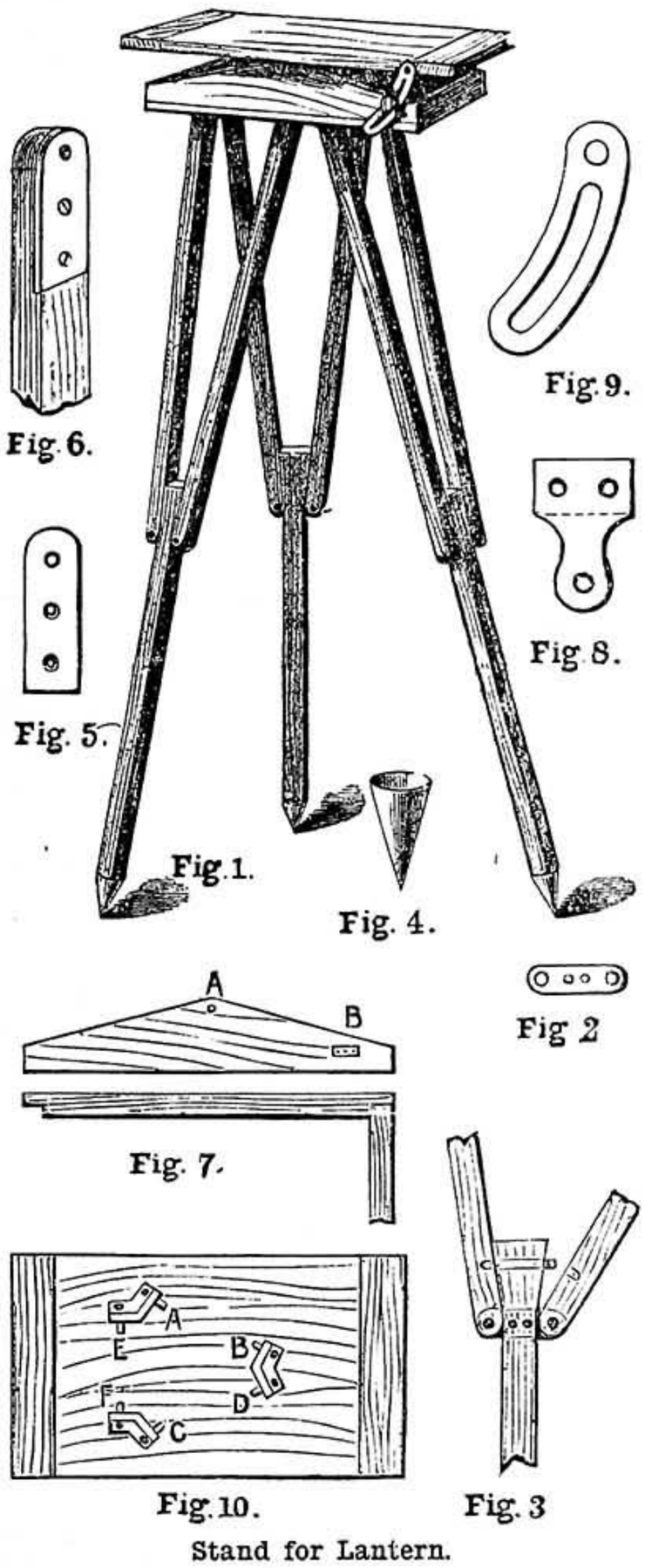
II.—Questions Answered by Editor and Staff.

Papier-Mâché Rollers. — F. P. (*Swansea*) should have named the purpose for which the rollers are required. Without a fair statement of the question, it is scarcely possible to give a satisfactory answer. Are they for rolling photos? If so, the sellers of photo. apparatus would supply them. As makers of articles in papier-mâché pulp generally, Messrs. McCallum & Hodgson, Summer Row, Birmingham, might be applied to; or with the directions already given in WORK, why could not F. P. make the rollers himself?—S. W.

Stationery.—RULER.—Your best plan will be to obtain an index from the publishers or through your bookseller, and look it up, and order your deficient numbers from it. But the best plan of all would be to order *all* numbers which you have not got, and so make your volume complete. There may be many things contained in them which would be of interest to you. There are books published upon bookbinding which are very high-priced, and which contain much information of a certain kind, but not what you desire. There is, however, a series of articles appearing in the *British Bookmaker* upon stationery binding which will suit you, and which you should not fail to consider. The magazine is published monthly, and the price is 6d.—G. C.

Cabinet-Makers' Tool-Chest, and Clockwork Cradle Swings.—IMPATIENT (*Thirsk*).—I myself, and others also, I believe, have given several useful suggestions relative to tool-chests in "Shop." A paper, however, on this subject will require a portion of the body of the magazine. Concerning the most suitable handles, I think that you, as a cabinet-maker, ought to be the best judge. Unfortunately I do not know where you can obtain the clockwork cradle swings; but perhaps this note will elicit information from someone possessed of such. As you saw one in the York exhibition, perhaps some of our readers resident in that county will step forward for our mutual benefit.—J. S.

Portable Stand for Optical Lantern.—F. C. (*Londonderry*) asks for a sketch of a portable stand suitable for a biunial lantern. A modification of the ordinary photographer's tripod, as shown in Fig. 1, forms an extremely portable stand for the purpose, which can be readily made by an amateur carpenter. The upper limb of each leg is formed of a couple of strips of ash or mahogany, 30 in. by ¾ in. by 1 in., the lower limb being a similar 30 in. strip of wood, which measures ¾ in. by 1 in for 27 in. of its length, and then widens out in the form of a wedge from 1 in to 1⅜ in. A mortise is cut through the wood just where it begins to widen, and a flat plate of brass, 2½ in. by ½ in by $\frac{1}{16}$ in., is drilled and filed to the form of Fig. 2, and inserted and screwed into the mortise in order to form the hinge, as shown in Fig. 3, the ends of the two upper wooden limbs being slit with a saw, and then hinged one on either side of the lower limb, as indicated in the cut. A 2 in. length of ¼ in. iron or brass rod is now tightly fitted into a hole bored through the widest portion of the wedge, with an equal amount of the rod projecting on the outside in either direction. These ends of the rod are made to fit into holes bored in a suitable position partially through either of the movable limbs, by which means the upper limbs will be rendered rigid upon the stand being opened. The lower end of the central limb will require to be pointed and provided with an iron toe-cap (Fig. 4), (to be obtained from Mr. Platt, Birkbeck Works, Birkbeck Road, Kingsland, N. No. 87 in list; 1½d. each); and the outside of each of the upper limbs must be furnished with a small brass plate (Fig. 5), which may be fixed in position by means of a couple of brass screws, as shown in Fig. 6. These plates are No. 7 in Mr. Platt's list; 2d. each. The table top of the stand must, of course, be made of a suitable size, according to requirements, but a board 12 in. by 18 in. may be taken as an example of a useful size. The bottom board of this diameter (shown in Fig. 10) should be furnished with a couple of cross ends, and a raised framework screwed round the upper surface, as shown in Fig. 1. The two long sides of this framework are 18 in. long and 6 in. wide in the centre, tapering off to 2 in. at either end (see Fig 7). The two strips for the ends of the framework will be 2 in. wide, and the length of the width of the board. The framework is put together with halved joints, as shown in plan in Fig. 7, and afterwards securely attached to the base-board. The movable table top, which may with advantage be a few inches larger than the base, is hinged to the apex of the raised framework by means of a couple of ordinary brass glass-plates, one of which is to be bent to right angles in the position shown by the dotted line in Fig. 8, and then screwed to the underneath of the table top, and afterwards pivoted to the framework at A, Fig. 7. The slotted arms, by which the position and angle of the table top is adjusted, consist of a couple of stout pieces of brass plate, 6 in. in length, drilled and filed up to the form of Fig. 9. These are pivoted by means of a screw to the edge of the board, and then secured at any desired position by means of a milled screw working in a plate affixed to the side of the framework in the position shown at B, Fig. 7. Mr. Platt's T-screw and nut-plate, No. 105, at 6d.



Stand for Lantern.

each, will answer the purpose. The stand is finally completed by the addition of a set of thin bearings, which are affixed to the under-side of the base, in the position indicated in Fig. 10—the distance between A, B, C, D, and E, F, being about 6 in., which will then enable the upper limbs to be sprung on to the projecting pins of each bearing. Mr. Platt can supply a set of thin bearings at 2s. 6d., No. 79. The stand is, of course, stained and varnished, or polished, according to taste. Although a tripod stand of the above description is frequently employed for lantern purposes, it is not by any means the best form of support to my mind, as the spread-out legs have a knack of getting in the way in the dark, which is very exasperating to the operator, and frequently damaging to the apparatus.

Another plan, which is far preferable to the stand above described, is the method adopted by Mr. T. C. Hepworth, a well-known lanternist of considerable experience. The four lower corners of the containing case of the lantern are furnished with iron sockets, into which four substantial iron legs (1 in. wide and ⅛ in. thick) can be readily slipped, the lower end of each support being turned in the form of a toe, which is provided with a hole in order that the legs can be affixed to the floor by means of screws. In Nos. 37, 38, 39, and 41 of the *Camera Magazine* I have described and illustrated several other forms of photographic camera stands, some of which are capable of being utilised for lantern work.—C. A. P.

Linesman's Galvanometer.—J. N. (*York*).—I will endeavour to comply with your request by sending in to the Editor an illustrated description of a linesman's galvanometer. It would occupy too much space in "Shop," as there will be several illustrations.—G. E. B.

Watch Work.—APPRENTICE.—I hardly like to advise; but if you have a fancy for watch making—or rather watch jobbing, I suppose you mean—why, there is many a worse-paying trade, also many better. If you go as an apprentice, make sure that the man is a practical one or keeps good workmen, and gets good work. It would not pay you to waste seven years at a shop where they clean watches at a shilling each. A *good* watch jobber can always get a place, and keep it if he likes, and at the same time earn good wages if at all up to the mark. Of course, wages vary in different towns, but roughly from 35s. to 50s. per week. There are plenty of jobbers about that are not worth their salt; perhaps I ought to say butchers, not jobbers or repairers. We are open to take a good jobber, and the last we paid on an average £2 a week and over, sometimes over £3, seldom under 35s.: but you must make yourself efficient, then you need not want a job long. Any further particulars if desired.—A. B. C.

Oiled Paper.—MAC.—(1) I assume from MAC's inquiry that he desires to prepare some of the above: I therefore give him the required information, which will enable him to do so with very little trouble, and make a good job of it. First, let him get four ordinary plasterer's or builder's laths, each of them to be longer than the largest sheet of paper he proposes to operate on, and tack, tie, or pin them together at the corners so as to form a frame just the size of the sheet he intends to use, and then to this frame evenly pin or otherwise attach the paper by its edges. Having done this so that the paper will not slip, let him get some good *boiled* linseed oil—not the *raw* oil—and a brush, and then, placing the frame and paper on a flat board or surface, go lightly and evenly all over it with the brush dipped in the oil, until it is evenly covered; and when this is done, set it on one side to dry, taking care, if he stands it in a vertical or sloping position, to reverse it two or three times during the first hour or two, in order to prevent the oil draining to the lowest part and making it "streaky." When dry—say, in twenty-four hours—if not transparent enough, let him give another coat to the reverse side of the paper, taking care in both cases not to use too much oil at once; and when dry, he will find it just what he wants. I have made hundreds of sheets of this for cultivating boxes and frames for raising seeds, etc., as it acted a deal better than glass, at the same time that it gave shade and prevented scorching. (2) No licence would be required under the conditions stated.—C. E.

Fig. 4

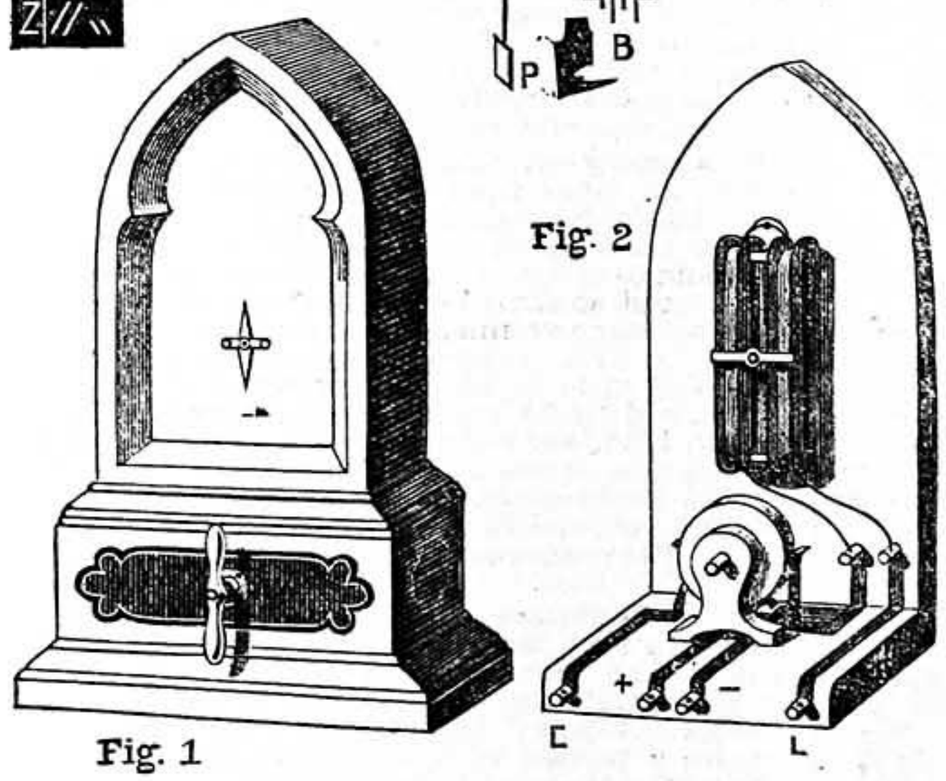


Fig. 1

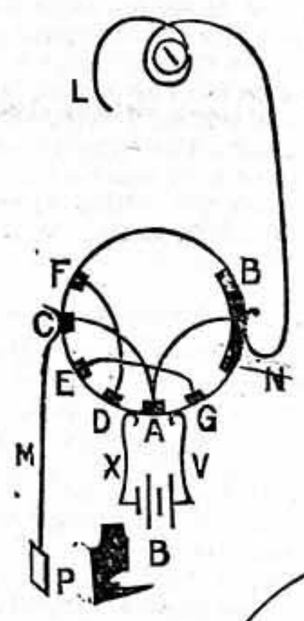


Fig. 3

Fig. 2

Needle Telegraph Instruments.

Lathe Wheel.—W. B. R. (*Westbury*).—I certainly do prefer the V grooves and gut-band, but the flat strap is about as good, and with a flat strap it is not necessary to have the rim of the wheel turned, so that saves expense. You could have a 24 in. or 30 in. wheel of about 70 lbs. with two steps for the belt—say, for the largest 24 in., and for the second speed 22 in.; let these work to two speeds on the mandrel of 3 in. and 5 in., and that will give you speed ratios of 8 and 4½ to 1, which is all you want for turning wood. I should try for such a wheel near at hand to save carriage; try at the nearest large ironmonger's or foundry. You must have it bored, but it need not have the rim turned.—F. A. M.

Cleaning Carpet and Mattress Tick.—W. B. (*Mildmay Road*).—If there are any special patches of grease on the carpet, pound and mix together fuller's-earth and magnesia in equal quantities; make into a paste with boiling water; lay this on the places, leave it till dry, and when it is thus brushed and beaten off, it will bring the grease with it. If the carpet is only generally dirty and faded-looking, after a thorough beating put a pint of bullock's gall into four gallons of soft water soapsuds, and with this scrub the carpet with a brush having long and softish bristles. The gall will brighten up the faded colours. As to the tick of spring mattress, W. B. is strongly advised to remove and have it washed—it cannot be thoroughly purified without; but if this is impossible, something may be done in the way of removing stains, grease, dirt, etc., by sponging with benzine.—S. W.

Needle Telegraph Instruments.—H. H. (*Aston*).—This is rather a large order for "Shop" column, as to give detailed instructions for making these instruments would require much more space than can be spared here. I have, however, drawn out such an instrument, and Fig. 1 gives the general appearance. The case should be of wood, with a glass front and brass handle. What is really wanted is a double bobbin, wound with about 400 ft. of No. 36 silk-covered wire; the two coils should be joined together, as will be seen at the top of Fig. 2. A strongly-magnetised needle is mounted on an axis to swing freely between the coils, and a light pointer is fixed to the axis so as to come to the front of the dial. The signs are made by making the current from a battery flow in different directions through the coil, by which the needle and pointer is deflected either right or left, according to the will of the operator. This is effected by what is called a commutator. Its construction will be seen from Fig. 2. It consists of a cylinder of boxwood, with a brass handle which projects in front of the case (Fig. 1). On its circumference, parallel to its axis, are seven brass strips, which are connected at the end by insulated wires in the following manner: A with B and C, F with D, E with G. Four springs press against the cylinder, X and Y are connected with the poles of the battery, M with the earth-plate, and N with one end of the coil. The line to be used between two stations may be No. 28 B.W.G. well insulated. I think that H. H. can easily make his instruments from this description, as I could not go into more detail at present.—W. D.

Carving Designs for Bedstead.—H. J. (*Bradford*).—I should think that you might find some suggestions in back numbers (see Indexes to Vols. I. and II.). Two good publications sometimes containing Italian carving are *The Cabinet Maker* (6d. monthly) and *Furniture and Decoration* (6d.). You see, one cannot do justice to carving designs in a small space; hence the reason I disappoint you for the present.—J. S.

Strength of Metals—Patterns, etc.—BRAMAH.—A very useful book, giving weights and strength of metals of all kinds, is Spon's "Engineers' Tables," price 1s. With regard to patterns of tinware, there were several articles on the subject in WORK, Vol. I. Have you seen them?—R. A.

Dead Black.—BRASSWORK.—For a good hard dead black, try "Enamelloid" (see "Guide to Good Things," WORK, No. 106). I have used this for blacking camera, lens, and so on, and find it answer admirably.—R. A.

Piano Stool.—F. D. B. (*Stamford Hill, N.*).—I believe that Mr. Gleeson-White, in an article on an Overmantel, and in another one dealing with a Sideboard in turned work, gave the name and address of a firm who supplies amateurs. Refer to the Indexes for the articles alluded to.—J. S.

Elliptic Curves.—J. B. (*Reading*).—The matter has been treated fully in former letters, my statements being based on standard works on geometry, to one of which I referred, as being, to my mind, the easiest to understand. As to *foci* not being the plural of *focus*, I must refer you to a dictionary.—F. C.

Bore Hole.—W. R. (*Burnbank*).—There is no better tool than the D bit. We are always boring holes of this character, sometimes as much as 8 ft. or 9 ft. long by from 2 in. to 2½ in. diameter. You will necessarily have more trouble with an inch hole than with one larger, because of the choking caused by the borings, and must also put up with the slowness of the process. In large drills we form a lip on the cutting edge to break up the chips, but this is not practicable with small ones. You must withdraw the drill to clear the hole as often as it becomes choked.—J.

Views on Glass.—A. E. S. (*Glasgow*).—I am not familiar with the method you name of obtaining views on glass, if it is done by means of a transfer from copper-plate; but there is a process of decorating glass which is something similar to your method, and from which perhaps you may gain a few hints. Designs are traced, in this case upon ground glass, with copal varnish, the best being used, as clear and devoid of colour as possible. It is allowed to stand in a warm, dry place for eight or ten hours until thoroughly dry, then immersed in clear cold water for five or ten minutes, and allowed to drain, being afterwards exposed to a moderate heat; and if the varnish is good it will be firmly set. The very best colours are afterwards used for colouring. Now, if your black was not a good one, it would account for it turning a smoke colour; and it strikes me that perhaps you did not give the varnish time enough to thoroughly dry before subjecting it to heat.—W. E. D., JR.

Kodak Detective Camera.—NOVICE.—There are many hand cameras in the market of about equal merit; it would be somewhat invidious to select one as superior to the rest. The qualities necessary for really practical work are, in the first place, simplicity; and secondly, effectiveness and non-liability to get out of order. The "Facile" and the "Ideal" are excellent, good work being easily done with either. In mentioning these we do not insinuate they are better than many others. In selecting, much depends on the fancy of the purchaser. With regard to the "Kodak," it is especially constructed to work with the roller slide and films. It is very simple; and where weight is of consequence, of course much less weight than if those cameras are used that require glass plates.—D.

Camera Bellows.—A. W. (*Paisley*).—Your design leaves nothing to be desired with regard to rigidity, but many other plans have the advantage of working almost automatically, thus saving time. According to plan sent, more time would be occupied in setting up and taking down the camera, as no provision is made for folding. The usual make of stretchers, besides acting as struts, permits the back of the camera to be swung, and by merely loosening or tightening a screw, no further trouble is required in opening and closing the apparatus than this; and the rapidity with which this can be effected is considered very important. The bellows seem to be one of the earliest patterns made.—D.

Mounting Prints on Linen.—H. N. (*Ipswich*).—Tack the linen or calico as tightly as possible on a frame or board, then coat it (the linen) with strong size, and leave till nearly dry. The back of the print must then be well covered with paste—this will be better done twice, the second time after leaving the first coat to soak about ten minutes—then place the print on the strained linen, and dab it all over with a clean cloth. When thoroughly dry, give face of print a coat of thin size. When dry again, repeat this. The size should not be too thick, or it will blister; nor too thin, or it will sink in; but a little practice on some inexpensive thing will soon teach you more than I can. When the two coats of size are thoroughly dry, varnish with white crystal varnish, such as paperhangers use, and which you can obtain at any good oil shop. When the varnish is quite set and dry, cut the thing off the frame, and it is ready for framing or mounting. A very good plan of my own for, say, a children's nursery is to simply wet the back of coloured print with a clean sponge, then paste (two coats, as above) round about ¾ in. of margin; stick it on the wall; it will strain quite tight. When dry, size and varnish as above. This gives a very cheerful effect to the room.—F. B.

Chemist.—A SUBSCRIBER FROM No. 1 (*Southampton*).—Write to the Secretary of the Pharmaceutical Society, Bloomsbury Square, London, W., and ask him to send you a prospectus of the next preliminary examination. This will probably contain all you wish to know; if not, send in another query to WORK. Your son should have passed this examination before being apprenticed, so that he could now confine his studies to chemistry. Your best plan is to push him through the preliminary as fast as possible.—F. B. C.

Decorative Window Frames in Cast Iron.—S. R. (*Manchester*).—The illustrations in No. 95 (Vol. II., page 689) were original designs, and have not, to the best of the designer's knowledge, been carried out by any manufacturer for "stock." It will be necessary to have patterns made, and place them in the hands of an iron-founder.—H. P.

Drawings for Patent Specification.—A REGULAR SUBSCRIBER.—The Patent Office is peremptory in its regulations as to drawings, and we should by no means advise sending a lithograph in lieu of the prescribed Indian-ink drawing on white paper.—C. C. C.

Crank Pin.—FAITHFUL READER (*Aberdare*).—The thickness of metal in brasses should be about one-ninth of the diameter of crank pin; the width of strap one and a half diameters. The connecting-rod end should extend one diameter beyond the crank pin, and have a breadth of two diameters of crank pin. The length of the crank pin should be one and a half diameters. These are rough proportions; for good work the stress on each part should be calculated, and the dimensions determined in accordance with the results.—F. C.

Staircasing and Handrailing.—J. W. F. (*Cheshire*).—Arrangements have been made for papers on these subjects. Staircasing will be treated separately.

Spoon Boxes.—A FRET-WORKER.—Have you searched the catalogues of the firms who deal in fret-work, who advertise frequently in WORK, for fret-work designs of the above? If not, do so. These are the only mediums I am acquainted with through which you are likely to obtain such; unless you inquire also of the editor of the *Amateur*, Messrs. Zilles & Co., Finsbury, London, E.C.—J. S.

Examination Papers.—ASPIRANT.—If you wish to obtain copies of the examination papers on electrical engineering given at the Technical College, Finsbury, I should advise you to apply to the secretary for them. I should do so if I wished for them, and should enclose a stamped addressed envelope for reply. You will then learn whether or not they are obtainable.—G. E. B.

Paddle-Wheel Electro-Motor.—G. P. (*Bebington*).—The paddle-wheel electro-motor you saw was probably one for rotating vacuum tubes. One for this purpose will be described at the end of the series of papers on Induction Coils. Had you told me what you wanted the motor for, I could have given you instructions for winding it; but I cannot undertake to describe half a dozen different motors on the chance of one of these suiting you. In any case, you must either have a lathe in which to turn the parts of a motor up true, or get them turned for you by someone who has a lathe, whether it is a paddle-wheel motor or any other type.—G. E. B.

Fret Machine.—R. W. (*Radnor*).—Enough upon the subject of utilising sewing machine parts for fret machine construction has already appeared in WORK. Consult the Indexes to Vols. I. and II.

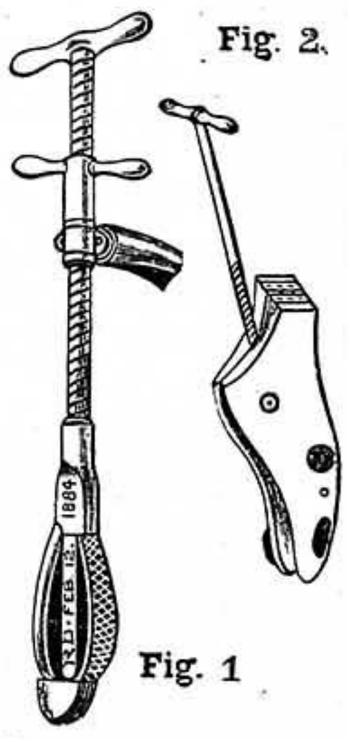


Fig. 2.

Fig. 1

Screw Lasts. Fig. 1.—"Boss" Stretcher. Fig. 2.—Joint Stretcher.

Screw Lasts.—D. (*Sunderland*).—As you ask for an "American screw last," I give in Fig. 1 the "Boss," price 12s. 6d., obtainable at the Wells Wire Quilting Company, Leicester. This is a length, as well as a girth, stretcher. Fig. 2 is a joint stretcher only, and can be bought at any leather-seller's shop; cost from 3s. 6d. Should you mean the last for repairing upon, there is only one with a screw in the market, which is called the "Perfect" repairing machine, price 3s. 3d. But if, as you say, you have one, you ought not to need another, as it, with its two caps complete, will fit from the smallest of children's boots to the largest of gentlemen's.—W. G.

Violin Bridges.—CLEVUM.—We are without the address of COMME IL FAUT, who should advertise in WORK.

Model House.—H. S. (*Oxford*).—These houses are made of different sizes, but Fig. 1 shows a perspective view of a very common size, with a few of the principal dimensions given. The house itself is principally made of cardboard, the flat piece, to which the house is fastened, being extra strong, and its rigidity is increased by three longitudinal strips of wood ¾ in. wide by ⅛ in. thick, one fastened down the centre, the others down the sides. The floor of the house is of wood, together with the two inclined supports and the figures and the ornaments on the roof. The sketch shows about the correct proportions and style of one class of house, which can be altered and ornamented to suit the taste. Thin coloured cardboard can be used for the walls, and painted to imitate stone, brick, etc. The decorations consist of gilt and various coloured stiff perforated papers and paper flowers, which, on account of the limited space in "Shop," I shall have to leave. The size of the house will all depend on the size of the figures used, as if the figures are bigger the openings must also be enlarged, and, for the sake of symmetry, the house also. I have shown in Fig. 1 a part of balcony removed, so that the space between the

Model House and Figures. Fig. 1.—Perspective View of House with Part of Balcony removed to show Platform for Figures.

floor and the bottom of the central partition, *e*, can be seen. It is about ⅜ of an inch, and is left to allow the figures to turn completely round, as well as to rise and fall as the gut contracts or expands. The principal difficulty will be in arranging the figures and catgut, so in Fig. 2 I have shown the arrangement entirely separated from the house. The dimensions of the figures, etc., here given suit a house of the size shown in Fig. 1. Having carved or otherwise obtained two figures, fix them by glue (as this seems to be the principal medium for fastening the parts together) to a flat piece of wood. In the centre of this, or, I should say, so that the figures will balance, place the round upright *a*, in this case 1 in. long by rather less than ¼ in. diameter, with a hole in top for gut, which latter should be about the thickness of the medium string in a fiddle, and is fastened therein by means of glue; before inserting the gut, tie a knot on the end. Do not cut the gut to the length shown in Fig 2, but leave it somewhat longer. Turn a small piece of wood, *c*, ¼ in. diameter, and fit it on the roof as shown at *d*, Figs. 1 and 2, and in such a position that a line through its centre passes just behind the pillar *e*, Fig. 1. Bore a hole ¼ in. diameter centrally through it, and turn a small cap and pin, *b*, to fit it easily. Bore a hole centrally through this just large enough for the gut to pass. Having fixed on the top, *c*, place the figures in their respective openings, with the central pin, *a*, behind the pillar, *e*, Fig. 1; pass the gut through the roof and *c*, and then thread it through the cap, *b*. Now place cap, *b*, in position shown in Fig. 2, and gently raise the figures by drawing up the gut till they swing midway between the floor and the bottom of the central pillar, *e*, Fig. 1. Now drive a small wooden peg dipped in glue into the hole where the gut is, and cut off both peg and gut. To prevent the figures moving sideways, form a square shaft by gluing to the central pillar, *e*, internally a piece of cardboard, taking care that the pin *a* is within before gluing it fast. A slight amount of play should be allowed between the pin and sides of shaft, so that there will be no perceptible friction to prevent the figures turning easily. The figures are set as shown in Fig. 1—that is, half in, half out, on some moderate day, when neither wet nor fine. This is done by turning the top of chimney, *b*; probably at first it will need a little bit of attention till the gut gets extended. I hope the above few remarks will be sufficient to explain away any difficulties. It is the want of space only which prevents a thorough description.—P. B. H.

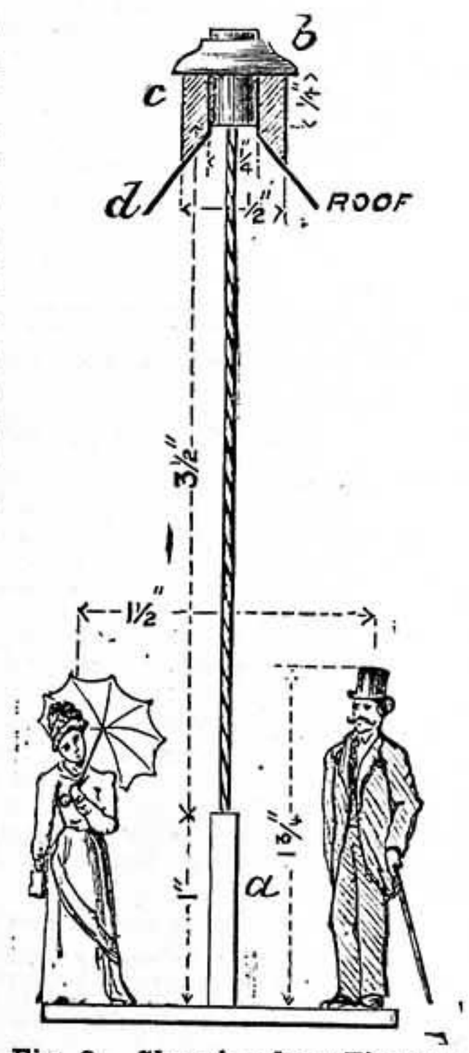
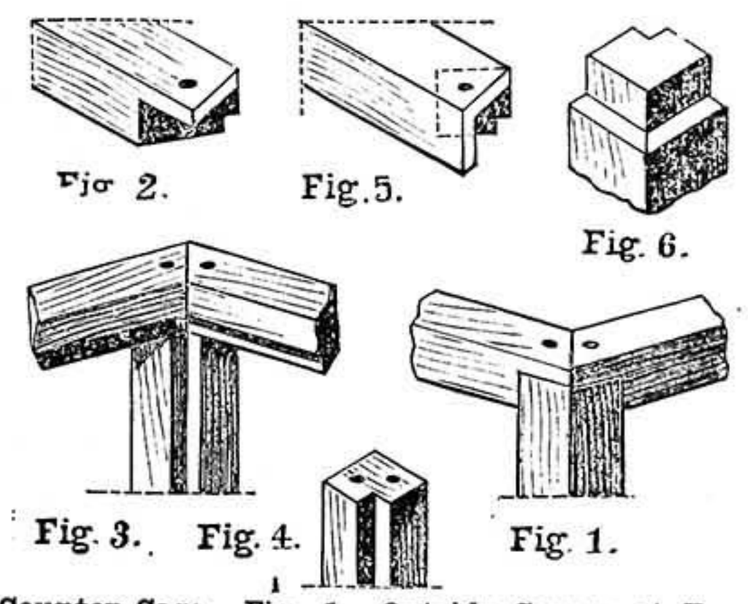


Fig. 2.—Showing how Figures are hung to Gut.

Shoemaker's Wax.—J. K. (*Farnley*).—Take 4 ozs. of pitch, 1 oz. of resin, and about a ½ oz. of good tallow, and heat them well on a slow fire in a pipkin or old saucepan (being very careful they do not take fire, as they are very combustible). Stir this admixture till the resin has melted and mixed well with the other ingredients; then pour the whole into a pail of cold water, and when it has got sufficiently cool to handle, put your hand underneath, and turn the edges over to the centre with the other, to make it into one ball. Take it out, and make it into a roll. Take one end in each hand, and pull it out as long as you can without breaking it. Double it, and pull out again and again; the more it is pulled (or worked) the better and brighter it will be. This done, lay it out on a slab, seeing it does not stick. Roll it out, cut it into strips about an inch wide, and cut the strips into pieces about an inch and a half long; each piece is called a ball. Wax has to be made hard in warm weather, and soft in cold. To make it softer, add more tallow; to make hard, use more resin. It is best to make it hard, as it can be made soft *ad lib.* without being again heated—simply by working a little tallow into it. It should always be kept in water to prevent it sticking to anything or together.—W. G.

Weights of Sheet Metals, etc.—NO NAME.—Yes, there is such a book; it is called "Engineers' Tables," published by Spon, Charing Cross. It contains, besides the weights of sheet metals, hundreds of other useful memoranda of all kinds, such as weight of hoop iron, chains, nuts and washers, round, square, and flat iron, carpenters' memoranda, bricklayers' and plasterers' ditto, and a variety of valuable information. It is a tiny book, and will go in the vest pocket. Price 1s.—R. A.

Counter Case.—H. B. (*Melbourne*).—The corners of your prospective counter case should be constructed after the manner described by the present sketches. As the corners will exactly resemble each other, and as also the bottoms will be similar to the tops, the explanation of one top corner will



Counter Case. Fig. 1.—Outside Corner at Top. Fig. 2.—End of a Top Rail. Fig. 3.—Inside Corner at Top. Fig. 4.—Upright. Figs. 5 and 6.—Alternative Methods of shaping Top and Bottom Rails and Uprights.

be sufficient. A sectionally square upright should be rebated from top to bottom, as in Fig. 4. That part of the upright will face the inside of the case. The horizontal rails will be halved and mitred over and around the block, as in Figs. 1 and 3, and screwed or dowelled there. These rails will be rebated as in Fig. 3. As an alternative method, and one much more difficult, albeit stronger, Fig. 5, as the end of a horizontal rail, and Fig. 6, as the top (and bottom) of the upright, might secure preference. Certainly I should not cut the glass until the wooden portion of the case is constructed. The glass can be fixed in by means of putty, or by sectionally triangular wooden strips glued over them into the rebates. They can then be easily repaired in case of damage. The bottom board could be covered in velvet, and fit within the bottom rebates. It is supposed that a hinged glass lid will bodily cover the top. Drawings are shown free from representations of beads or chamfers, to avoid confusion.—J. S.

Photograph Enlarging.—H. J. H. (*Hackney*).—The method of enlarging from ferrotype or other positives is very similar to that of enlarging from negatives. Fix up the picture to be copied in a good light, avoiding reflections, and proceed as in enlarging from a negative. A negative will be the result, and can be printed direct or copied again in the camera, when a positive will result, suitable for bromide and enlargements of that class. The chief difference is in the exposure, an opaque picture requiring rather longer than a transparency. All pictures that have to be copied by reflected light are necessarily produced in a similar manner in one operation if a negative to print from is required, and in two operations if the desired result is to be a developed positive.—D.

Shoe Gloss.—SNOBBERY.—No; boot finishers do not put anything into their ink. The cause of the permanent gloss on heels finished by a finisher is the ink which he uses, and the method of ironing afterwards. You should get good American burnishing ink, and add one-third of ordinary shoemakers' ink. Put this on in the ordinary way, and when it has dried to just a nice dark blue (that is not what is generally called "bone dry"), iron up with a warm glazing-iron, or, better still, a double-handled burnisher. It should be rubbed on hard, even, and firm, and with a quick motion. When it is quite bright all over, slightly damp it down, and burnish again. This done, iron on heelball, and then rub it off even with an old cloth. To finish, rub a little whiteball on the cloth, and polish the heel with it. Fake is often used instead of heelball; it is a more ready method, as it is only rubbed on with the finger, and therefore saves the last ironing. It also gives a good polish when used instead of whiteball. To prevent heels cracking, flesh the back and buff off the grain of each piece of leather. Use it when it is only mellow—that is, not too wet or too dry—and do not hammer the heel stuff too hard. Put a little paste on each lift before you put on another, and after the heel is knifed up, properly pare the edge, and never finish till the heel is dry. Rasp each lift to make it rough before applying the paste.—W. G.

Nails.—J. C. (*Cheadle*).—Try the large Sheffield nail makers for the nail you require.

WORK Back Numbers.—E. H. (*Sunderland*).—The parts of WORK from January, 1891, to May, 1891, price 6d. each, can be had on order of any bookseller.

WORK Exhibition Certificate Frame.—N. M. (*Glasgow*) AND OTHERS.—A special article on this subject is not deemed necessary. Any contribution to "Shop," Section I., will be attended to.

Bicycle Wheels.—G. P. (*Gloucester*).—The Victor Cycle Co., Grimsby, supply these wheels.

Turkeys.—M. H. (*Higher Walton*).—The question you ask is not suited to this Journal. Write to one of the Poultry Journals.

Umbrella Silk.—L. B. (*Marylebone, W.*).—A good wearing Union (mixture of silk and wool or silk and cotton) will cost from 2s. 3d. to 4s. per yard; a silk (pure) from 2s. 9d. to 5s.; and can be obtained from Messrs. Morland & Sons, Wood Street, Cheapside, or Messrs. James Ince & Son, 64, Bishopsgate Street Without, E.C.—H. W.

Violin Making.—W. W. (*Patterdale*).—You do not enclose stamps, so that the copy of WORK cannot be sent you. Procure the Indexes to Vols. I. and II. through your bookseller. The violin articles are now running through Vol. III.

Condensing Engine, Book on.—YOUNG ENGINE DRIVER.—"The Theory and Action of the Steam Engine," by W. H. Northcott, C.E.; 3s. 6d.

Printing on Tin.—ANXIOUS.—If this correspondent by "printing on tin" means the decorating of tin, such as the fancy biscuit boxes, etc., I can only say that it is a patent process, and it is not in my power to give particulars of same. Apply to the Tin-Plate Decorating Company, Neath.—R. A.

Zither.—J. M. B. (*London, W.*).—The article on how to make a Zither is in the Editor's hands, and only awaits space for publication.—R. F.

Renovating Chair Seats.—W. B. (*No Address*).—There is no way of renovating worn leather seats; the chairs must, to make a good job, be re-covered. Any attempt at partial dyeing will make matters worse. The faded leather may, however, be freshened up. Some advise a little French polish to be laid on very lightly, care being taken not to saturate the leather. Some advise white of egg as a reviver; and there is an article sold at shoe and other shops as "kid reviver," which might be used.—S. W.

Imitation Ivory.—HARD UP.—I can give methods for home-made imitations of ivory suited merely to decorative purposes, but umbrella handles would need more strength. The best imitation of ivory is, I believe, "ivorine," and this, probably, would be the thing for HARD UP. But he will have to get it from the makers, the British Xylonite Company, 124, High Street, Homerton, E. It costs 4s. or 5s. per lb., and works easily.—S. W.

Leclanché Cells.—A. C. (*Croydon*).—It would be well for you to advertise your prices, with name and address, in the cheap "Sale and Exchange" columns of WORK.

Silent Gas Engine.—A NEW READER.—The gas engine is rendered silent by the system of compressing the charge before exploding it, and the compression gas engine has not been treated in WORK. Your non-compression engine should give out more than one man-power if of 5 in. diameter and 11 in. stroke; a cylinder of that size on the compression system would be much more powerful, because by compressing the charge the gases burn slower and more gradually; instead of a sudden kick at the crank-shaft, as in yours, you get a longer push. To convert your engine would be very difficult, if not impossible.—F. A. M.

Binding WORK.—NED.—You should write upon this subject to the publishers, Messrs. Cassell & Co., Limited, Ludgate Hill, London, E.C.

Bamboo.—A. M. S. (*Westminster*).—The firms named below deal in this article:—F. Westbury, 183, Great Dover Street, S.E.; Benjamin & Co., 168, Great Dover Street, S.E.; W. and T. Elmore and Sons, 16, City Road, E.C.; and S. J. Eaton & Co., 3, New Inn Yard, Tottenham Court Road, W.—M. M.

III.—QUESTIONS SUBMITTED TO CORRESPONDENTS.

Inking Roller Composition.—C. D. (*Glasgow*) writes:—"I should be much obliged for any instructions as to how to make a small inking roller, including composition of 'dolly,' to be used for inking woodcuts."

Rubber Balls and Balloons.—Z. Z. Z. (*Wednesbury*) writes:—"Will any reader kindly tell me how to make toy indiarubber balloons and indiarubber balls?"

Steam-Ship "Sarah Sands."—W. W. (*Canning Town*) writes:—"Will any kind reader, or seafaring one that may have been aboard the S.S. *Sarah Sands*, which was destroyed by fire, inform me where I can obtain a book of the above-named ship that speaks of the bravery of Fireman Woodward?"

Hydraulic Lifts.—ANXIOUS writes:—"Would any reader be kind enough to explain the system of the working of hydraulic lifts, etc.?"

Carpenter's Bench.—R. S. D. (*Edinburgh*) writes:—"In the number of WORK for October 4, 1890, page 471, under the heading 'Carpenter's Bench,' E. D., in reply to J. B. F. (*Brixton*), describes a bench, and states that it can be obtained for 30s. I should be glad if he could inform me where; also whether a considerably smaller one, with thinner top, could be got for £1."

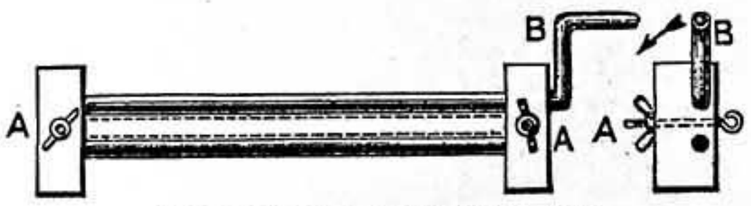
Ink Blots.—INKY writes:—"Can anything be made to get out marking-ink blots or names in linen?"

Tricycle.—W. R. (*Mile End*) writes:—"Will any reader kindly inform me how to make a tricycle to work with my hands? I want it with a place to convey toy goods in, as I am lame."

Umbrella Fittings, Negatives, etc.—CONSTANT SUBSCRIBER writes:—"Will any reader tell me a place where I can get umbrella fittings with which to do jobbing work, repairs, etc.? Also I should be glad to know of a method of getting rid of rain stains on negative caused by getting wet during exposure. I have got silver stains off, but rain stain spots remain."

IV.—QUESTIONS ANSWERED BY CORRESPONDENTS.

Hoop Rollers.—A. H. L. (*Higher Bebington*) writes, in reply to A. L. (*London*) (see page 94, No. 110):—"A cheap apparatus for bending tin, etc., might be constructed as follows: Take three pieces of iron pipe 1½ in. diameter. To one of these attach a handle, and place it with one of the others, 2 in. from each other, on or in a wooden frame, so that the ends rest on or in bearings, so that they may revolve easily. The third piece of tube should be



Apparatus for bending Tin.

plugged at the ends, and axles formed, of such size as to work in the eyes of eye-bolts, having a nut on the end of each, as in diagram. To work, place the edge of the sheet over the middle roller (piece of tube) and under the other two; turn the wing-nuts till sufficient curve has been obtained, and then draw the sheet through between the rollers, turning the handle (B) in the direction of the arrow."

Air Cushion.—E. L. (*No Address*) writes, in reply to H. R. (*Clapham*) (see page 222, No. 118):—"Fill the cushion with wind, and put it under water. You will soon find out by bubbles where the hole is. It depends what material it is made of before I can say what to repair it with, but should think indiarubber solution. Prout's glue is of no use: it cracks."

V.—BRIEF ACKNOWLEDGMENTS.

Questions have been received from the following correspondents, and answers only await space in SHOP, upon which there is great pressure:—G. S. R. (*Tewkesbury*); THE GOLDSMITHS' CO.; O. B. (*Preston*); W. H. K. (*Accrington*); T. R. H. (*Manchester*); A. S. (*Rotherhithe*); J. N. (*York*); W. J. T. (*Cardiff*); J. E. W. (*Burslem*); G. F. C. (*Southampton*); T. W. B. (*Leicester*); W. M. (*Derby*); STRIKE-A-LIGHT; H. M. (*Liverpool*); READER OF "WORK"; N. H. (*Huddersfield*); H. J. M. (*Bristol*); F. I. (*Highbury Grange*); A NEW READER; J. G. (*Glasgow*); T. R. E. (*Darlington*); EYRE; W. S. M. (*Brixton Hill*); F. D. (*Leswalt, N.B.*); A. R. (*Scorrier*); F. S. (*Reading*); G. H. (*Clerkenwell, E.C.*); J. B. (*Devonport*); T. W. (*King's Cross*); T. W. W. (*Hastings*); S. R. P. (*Kilburn, N.W.*); L. W. (*Islington*); P. R. (*Birmingham*); W. A. (*Bury St. Edmunds*); W. C. B. (*Bolton*); T. W. A. (*Stockton-on-Tees*); F. M. G. (*Honnesdon*); ANXIOUS; R. E. (*Bolton*); PROTECTION; ALLOY; J. E. M. R. (*Stratford*); A NEW SUBSCRIBER; GUGLIELMUS; X. Y. Z.; W. J. H. P. (*Cookstown*); ANXIOUS B.; B. O. (*Alsager*); CLIP; L. J. K. (*Dublin*); H. H. (*Eastleigh*); C. G. E. (*Manchester*); RINGER; W. J. C. (*Jersey*); H. B. (*Wakefield*).

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